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1984

NORTH BOUNDARY CONTAINMENT / TREATMENT SYSTEM PERFORMANCE REPORT

ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO

DTIC
ELECTE
NOV 30 1993



ROCKY MOUNTAIN ARSENAL
US ARMY MATERIEL COMMAND

Volume II

by

Edwin W. Berry
Brian L. Anderson

Technical Operations Directorate
Rocky Mountain Arsenal

James H. May
Richard L. Hunt

Geotechnical Laboratory
USAE Waterways Experiment Station

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Environmental Laboratory
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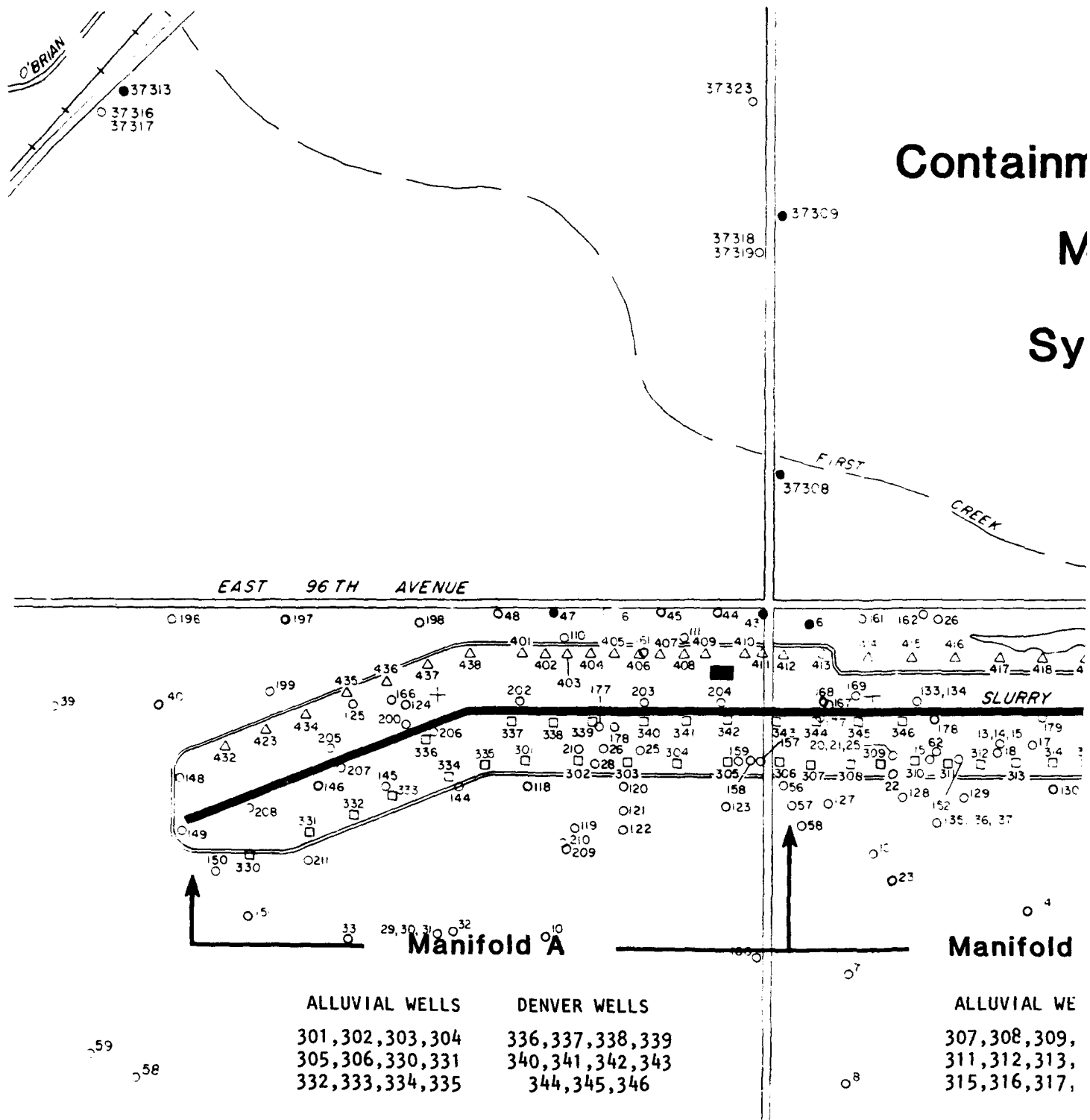


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December 1985

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DTHC QUALITY INSPECTED

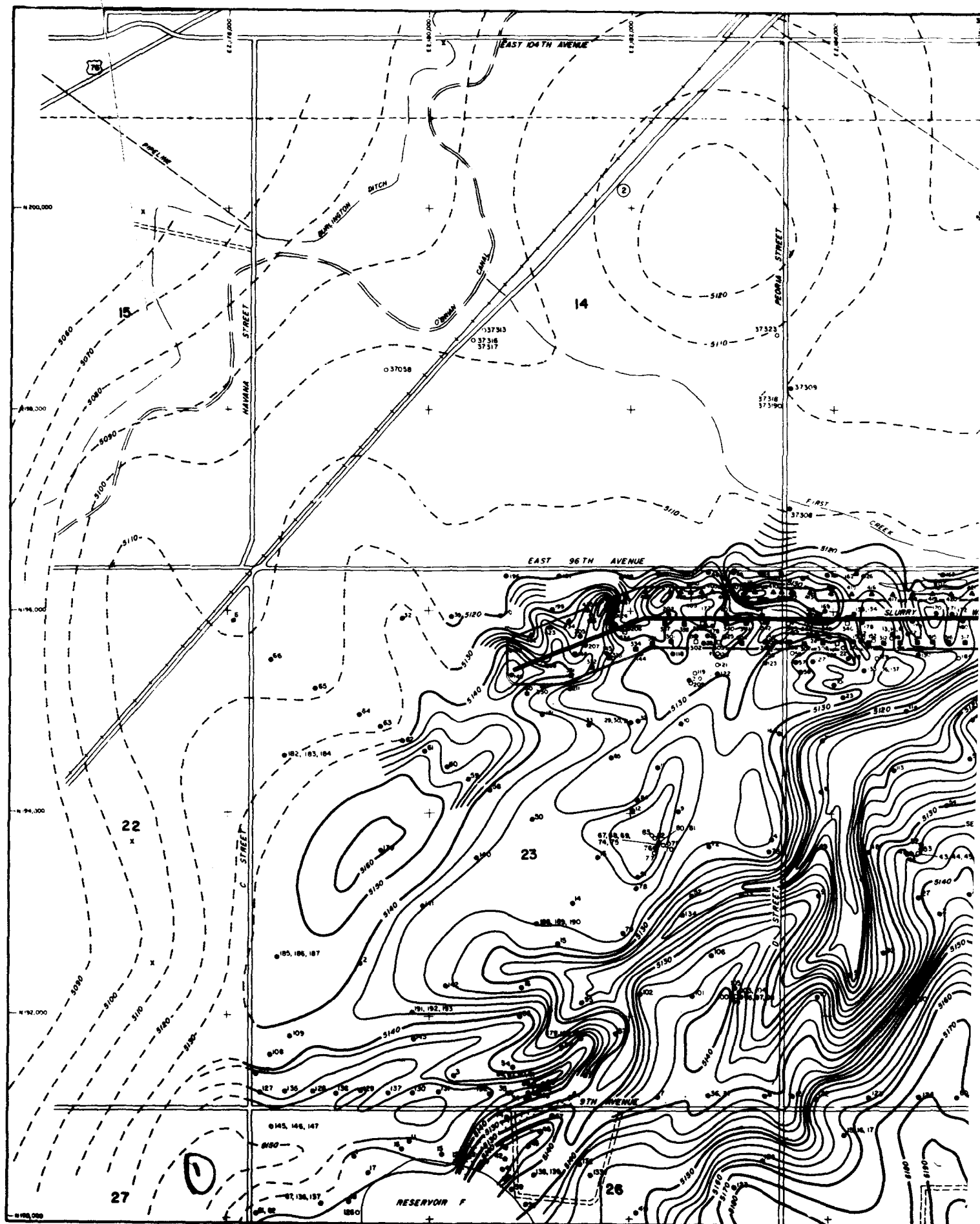
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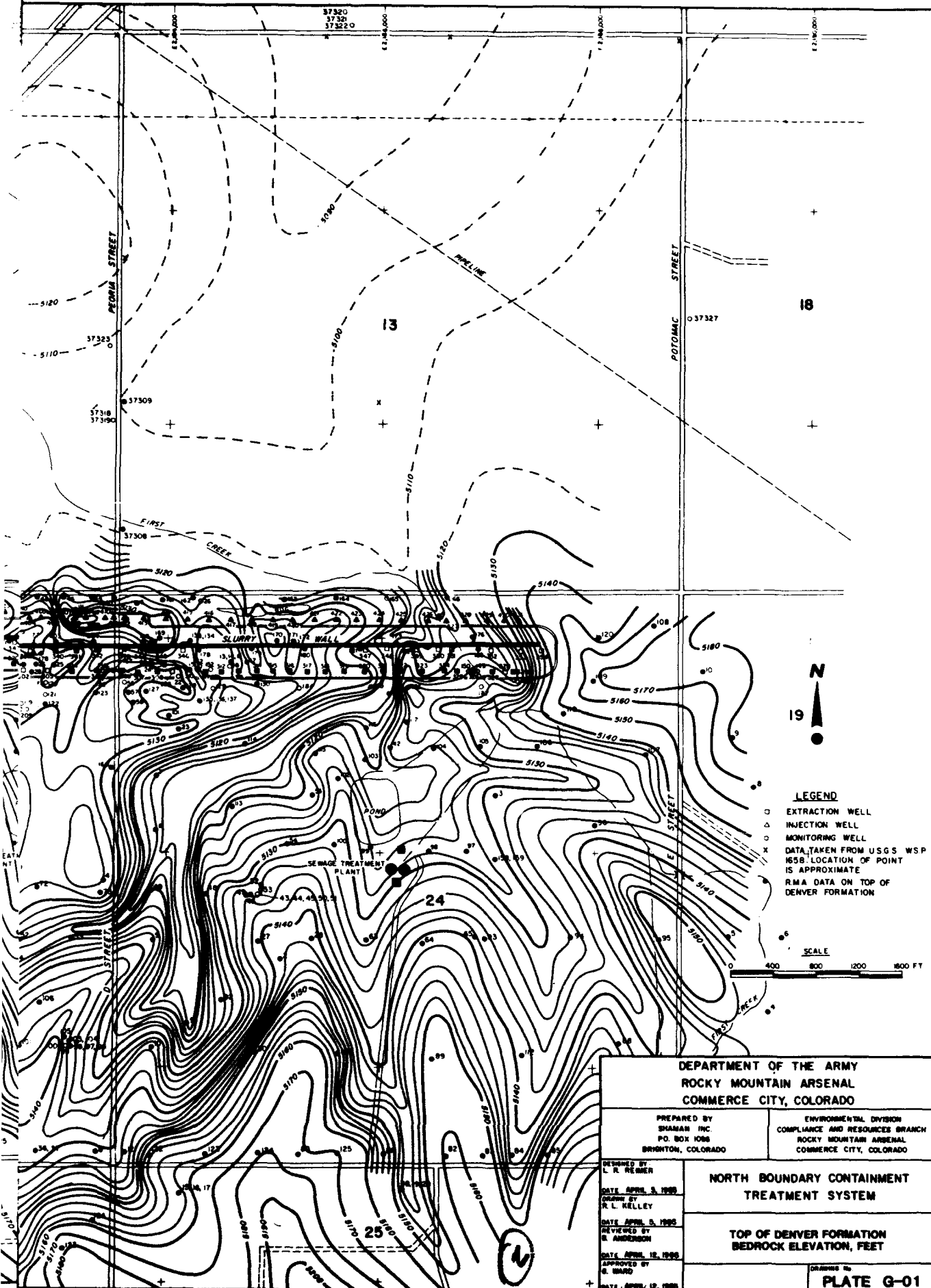


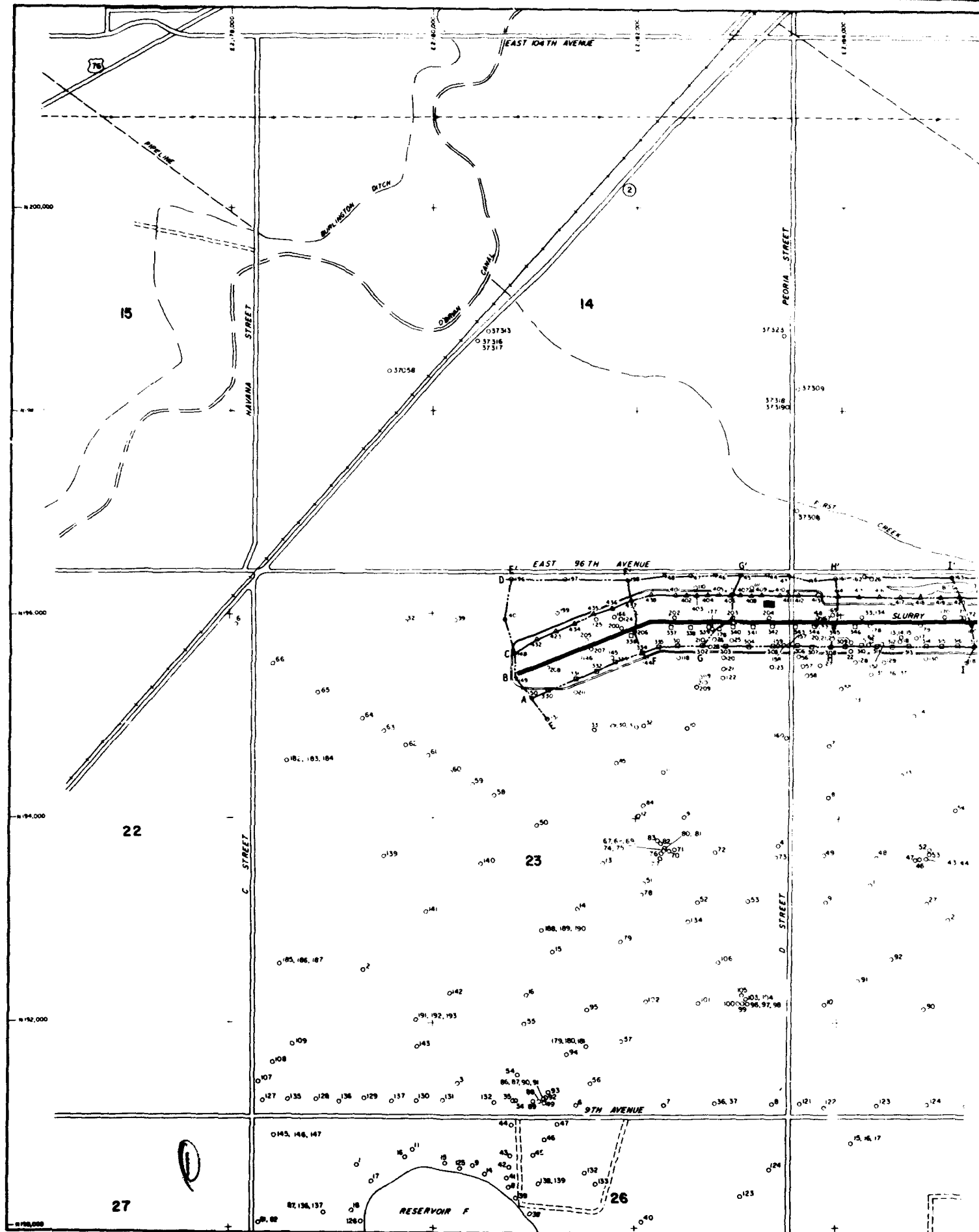
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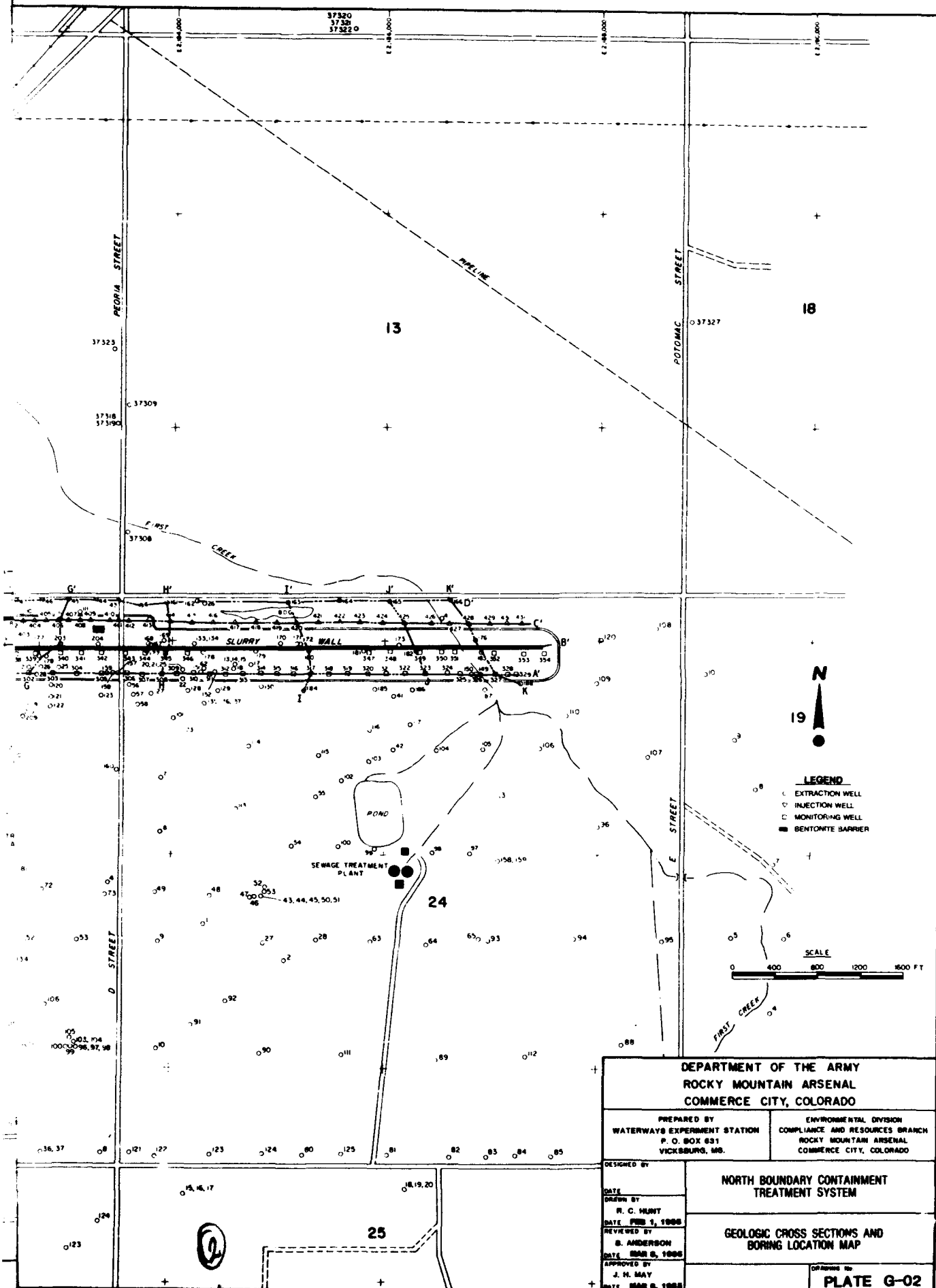
GEOLOGY PLATES

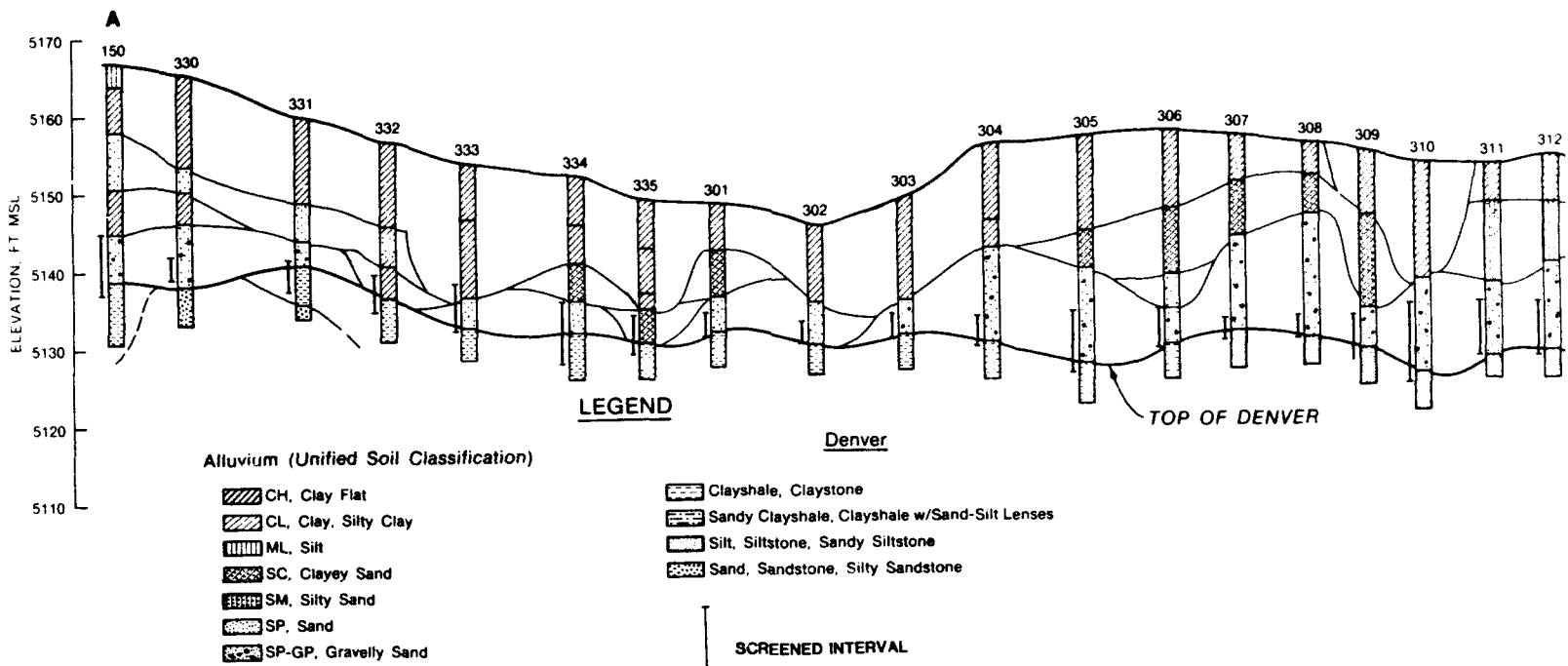
G-01 thru G-08

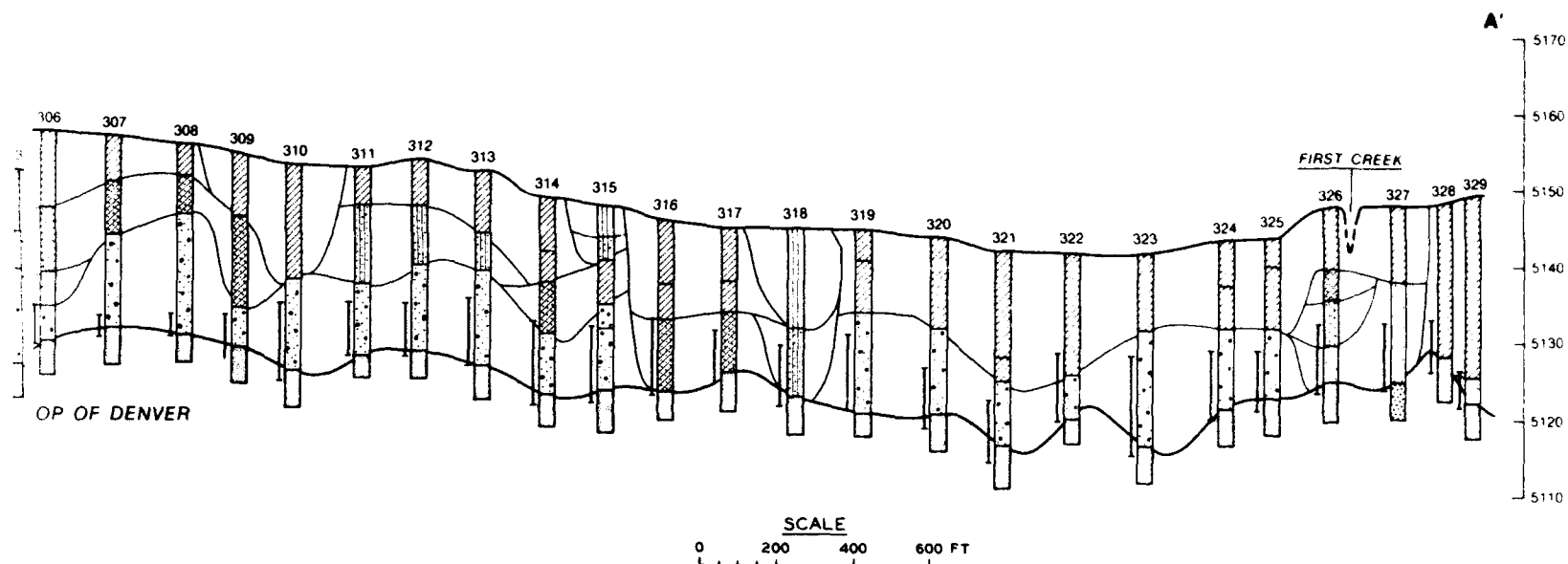






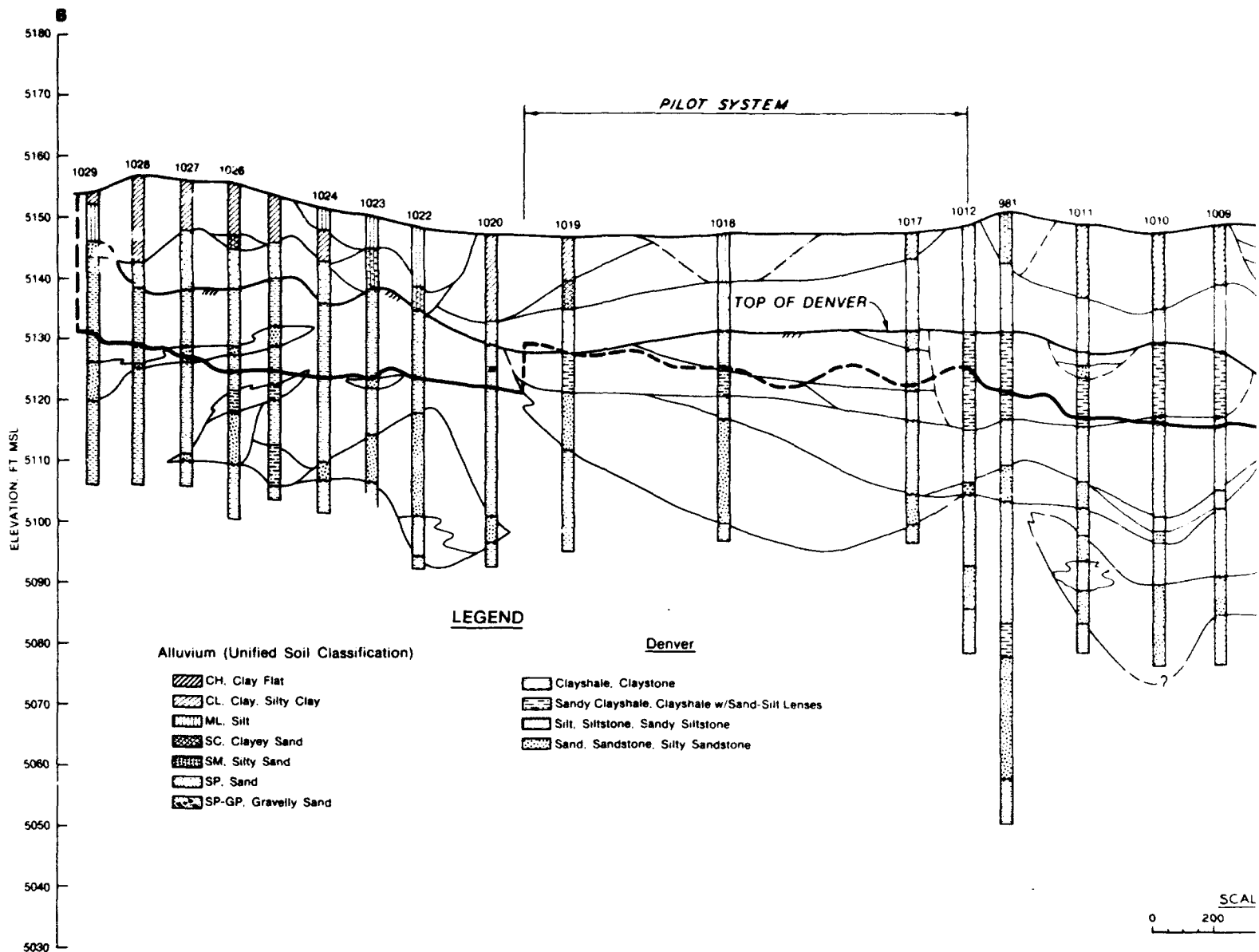


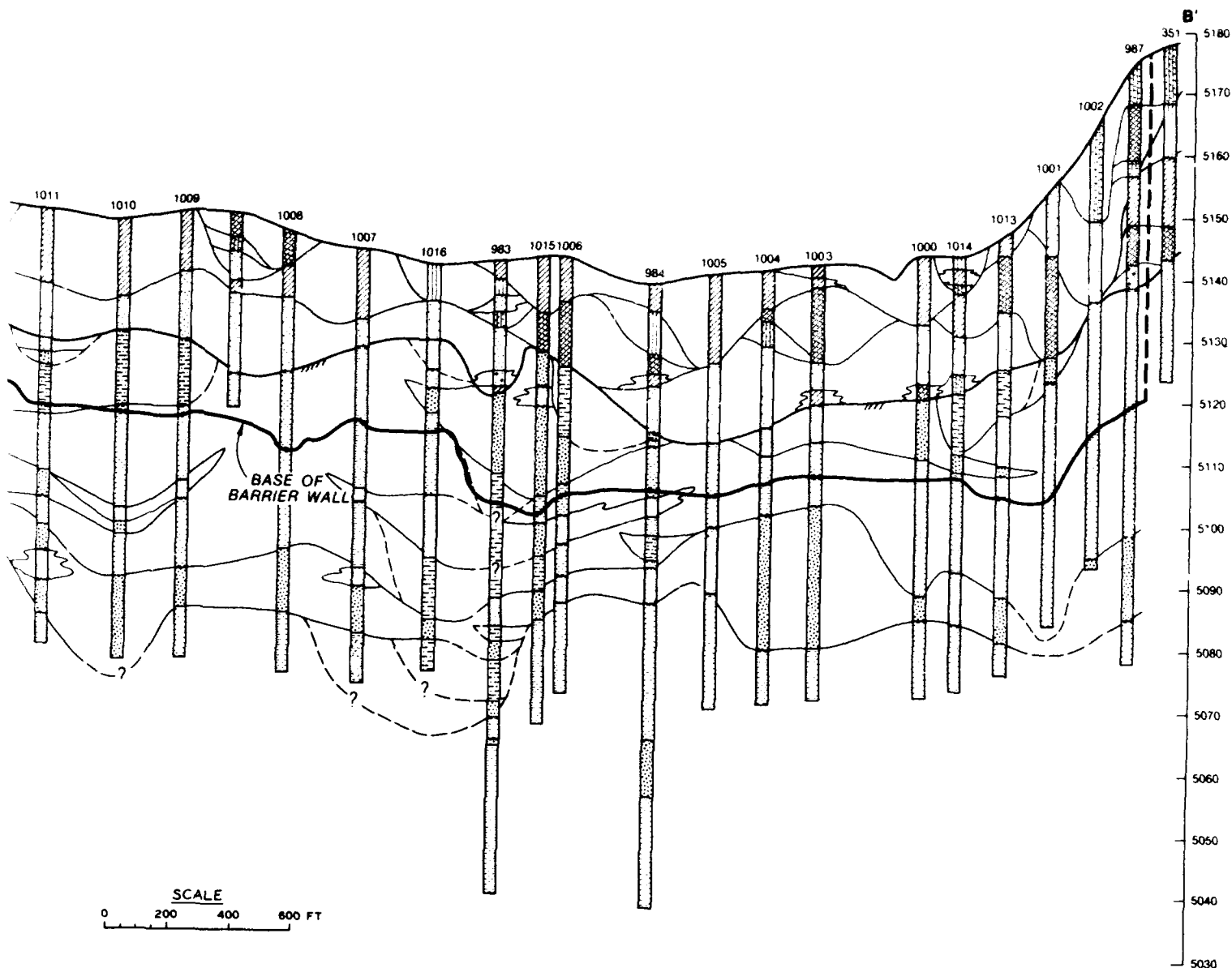




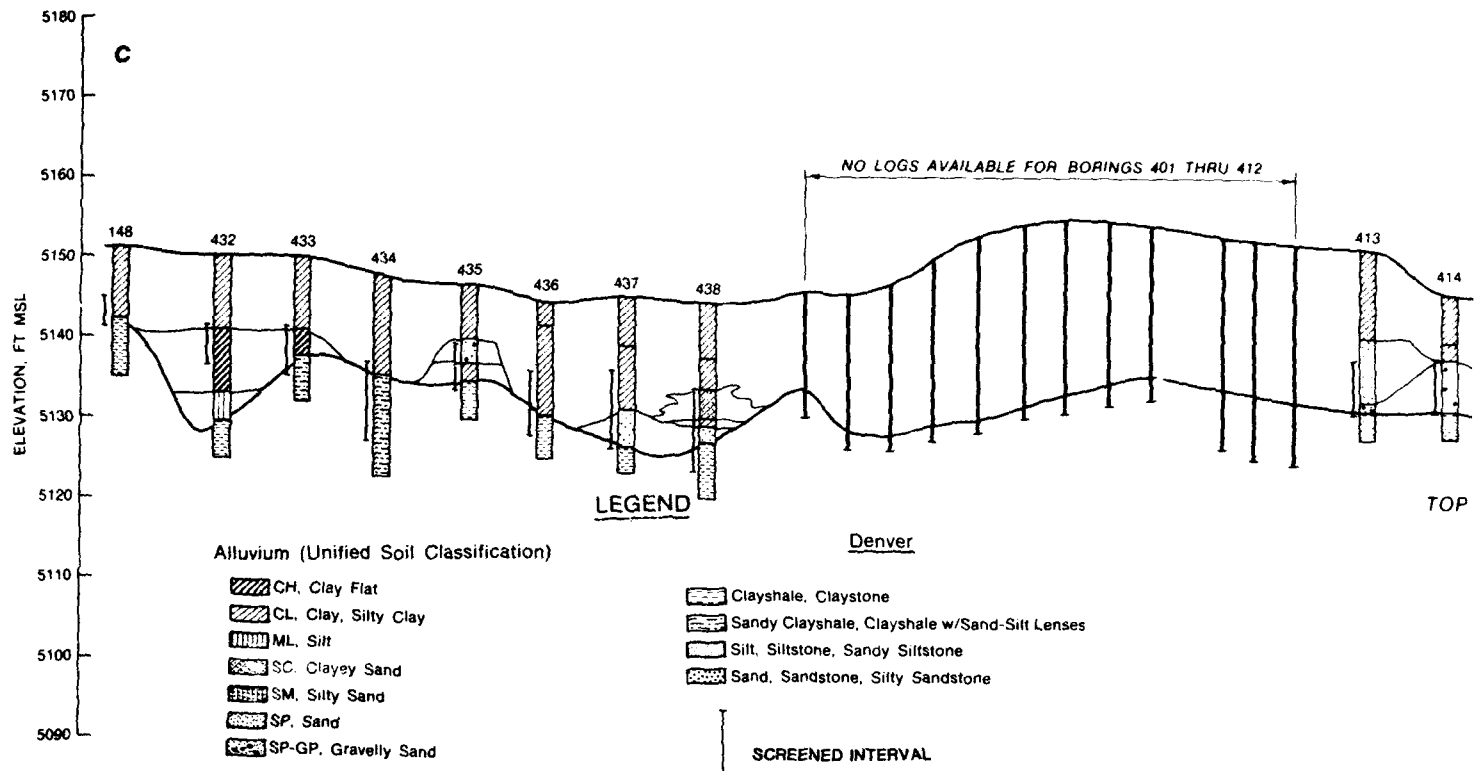
DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 631 VICKSBURG, MS.	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
DESIGNED BY DATE DRAWN BY R. C. HUNT DATE FEB 1, 1985 REVIEWED BY B. ANDERSON DATE MAR 8, 1985 APPROVED BY J. H. MAY DATE MAR 8, 1985	NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM CROSS SECTION A-A' DRAWING No PLATE G-03

(2)

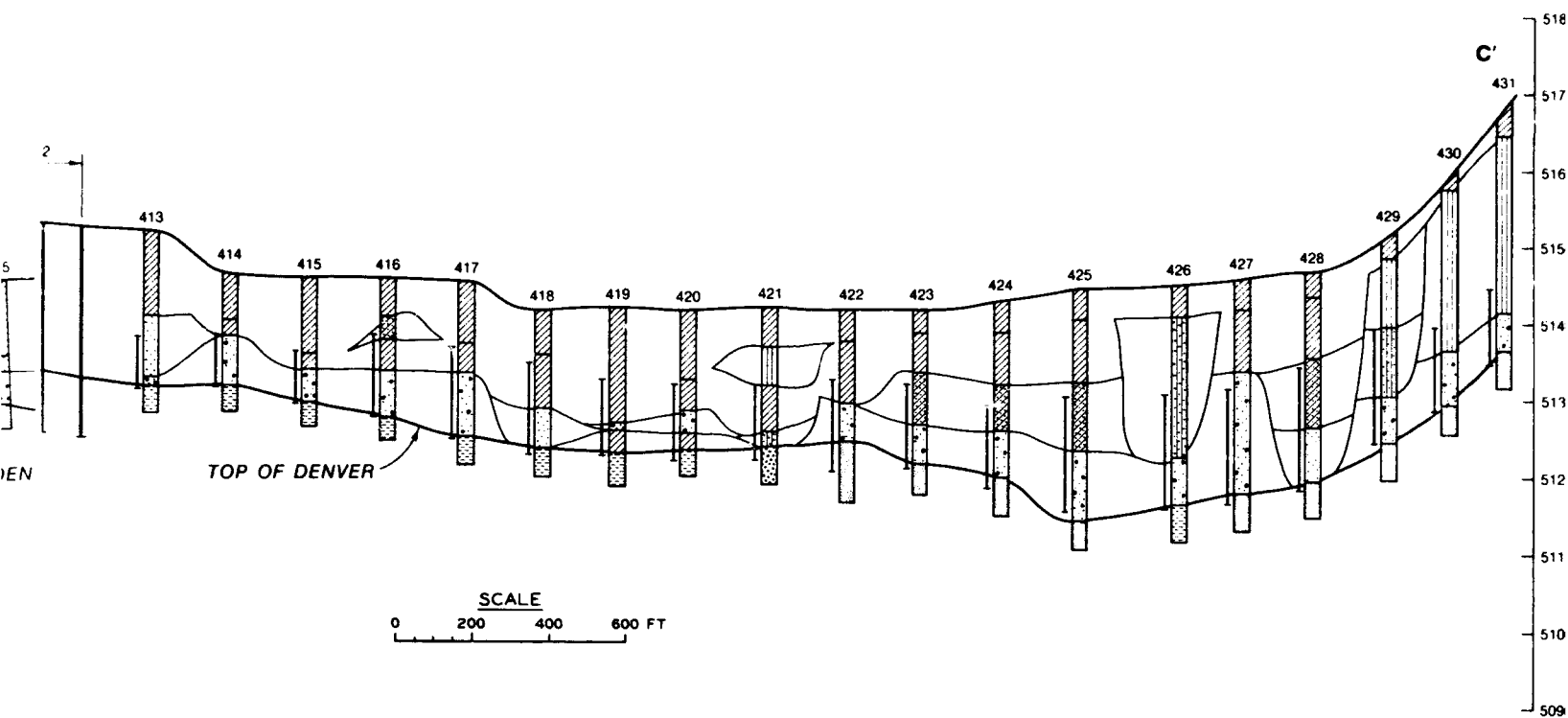




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	DRAWING No. PLATE G-04

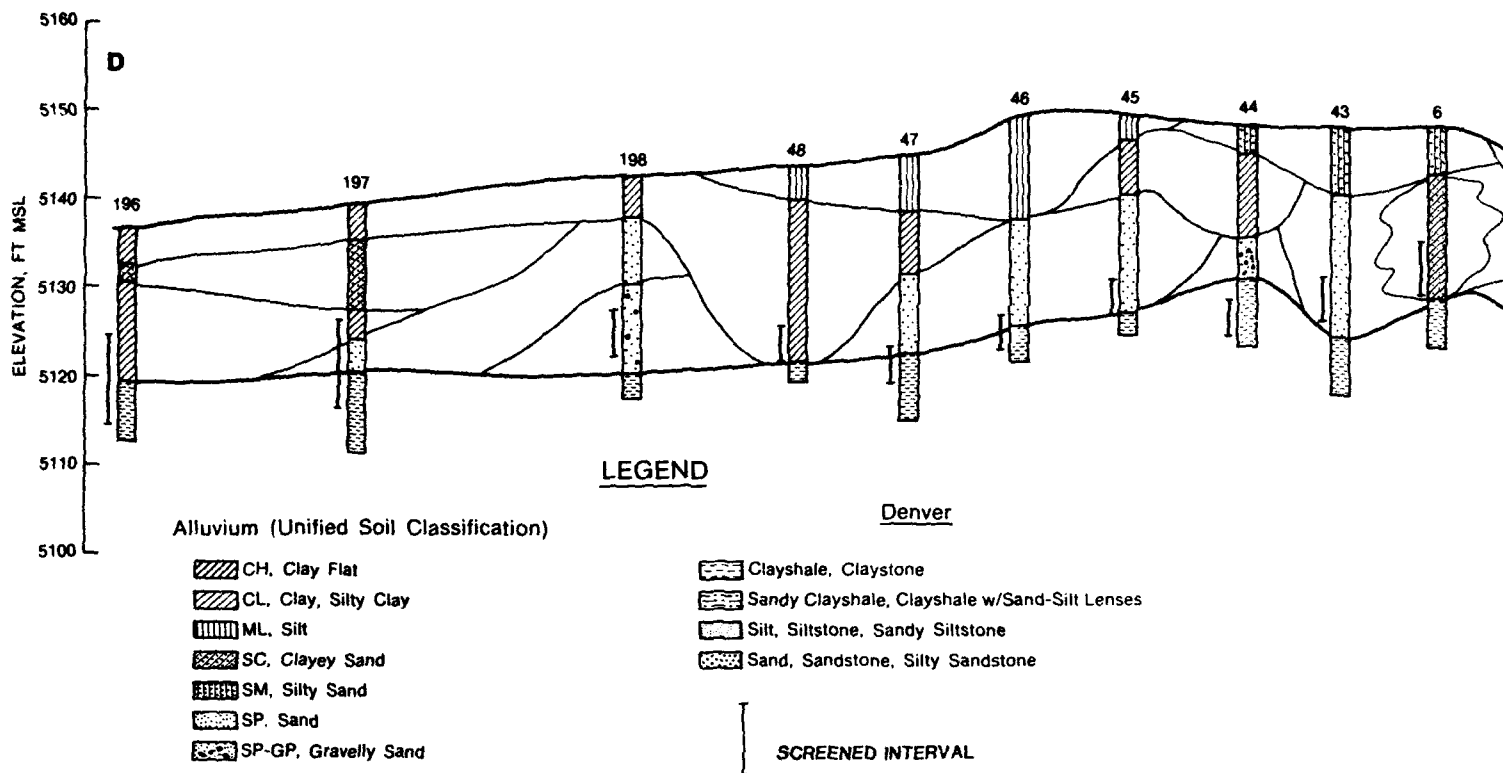


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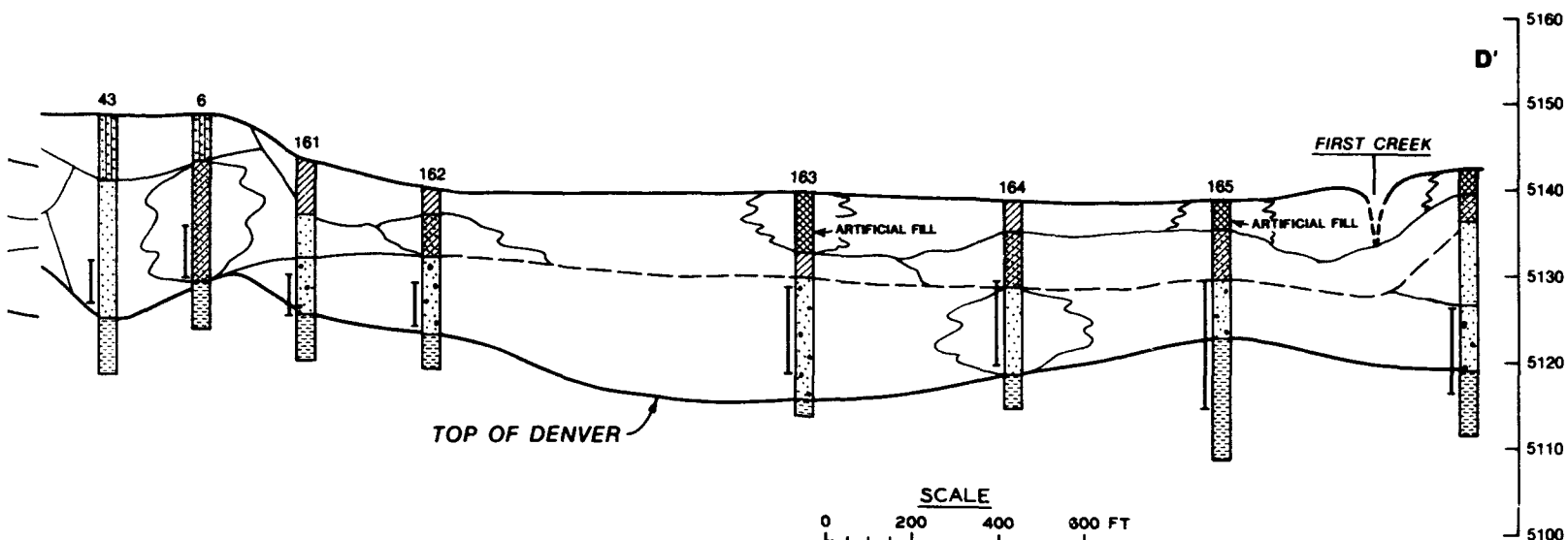


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PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 631 VICKSBURG, MS.	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
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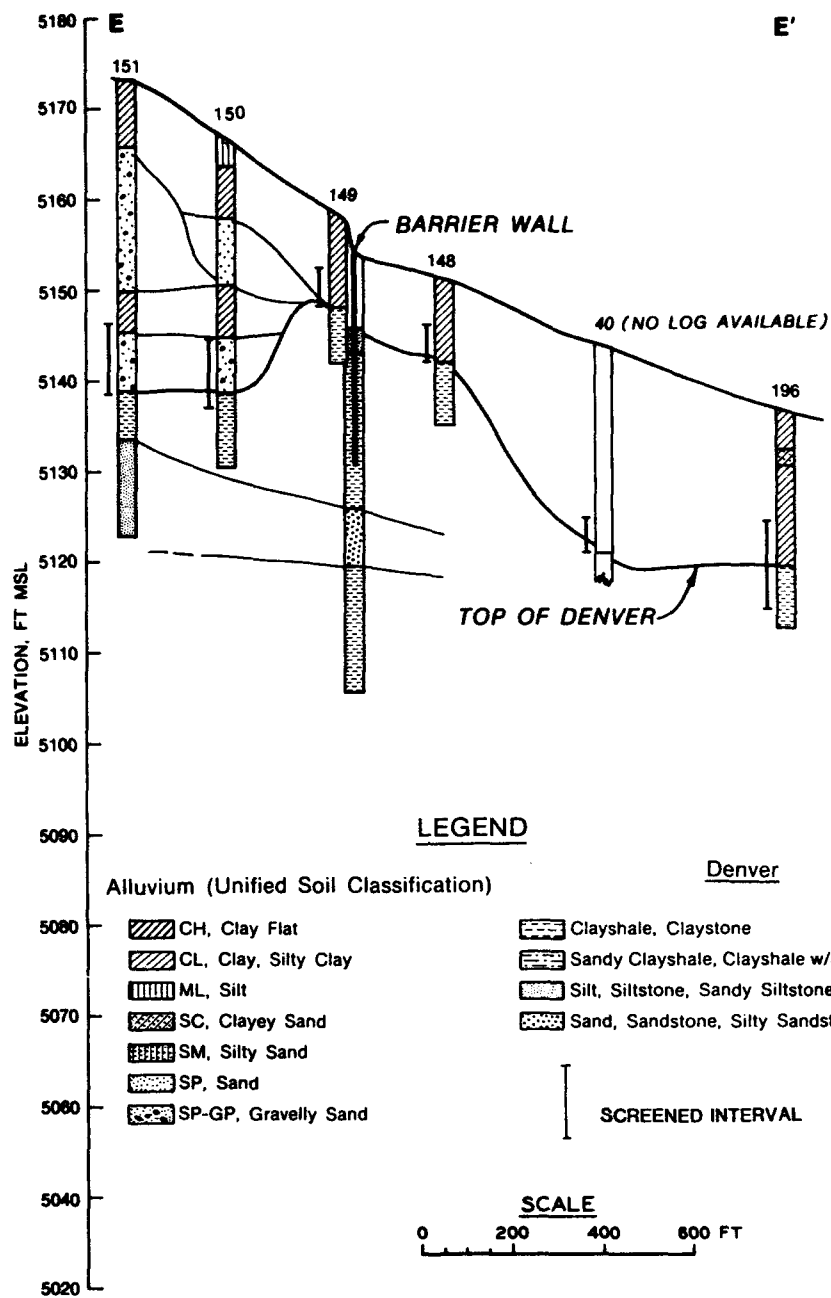


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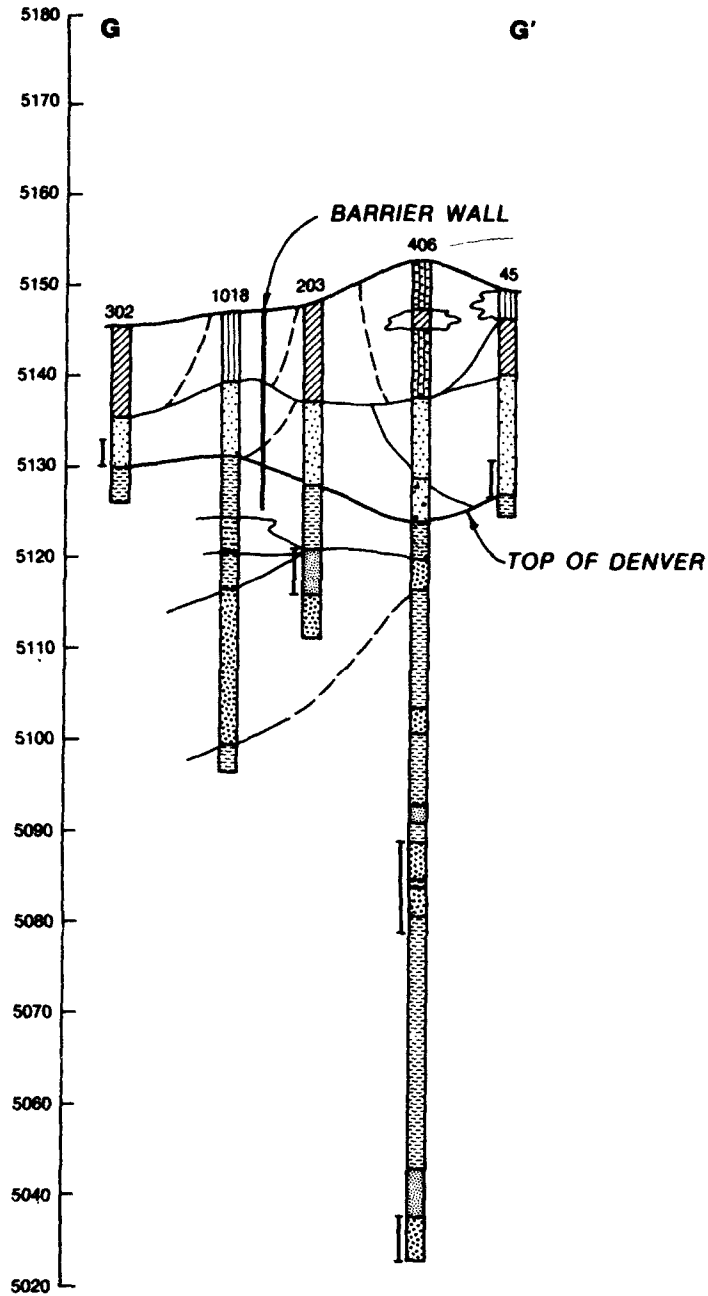
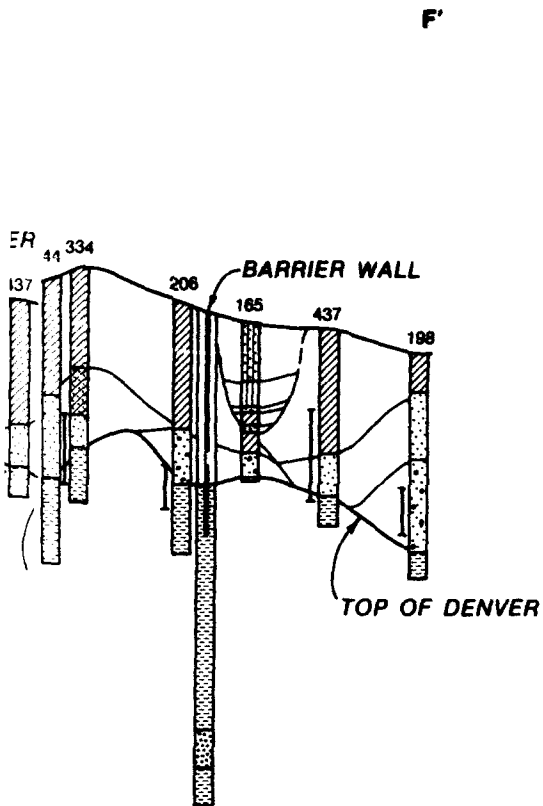


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(2)

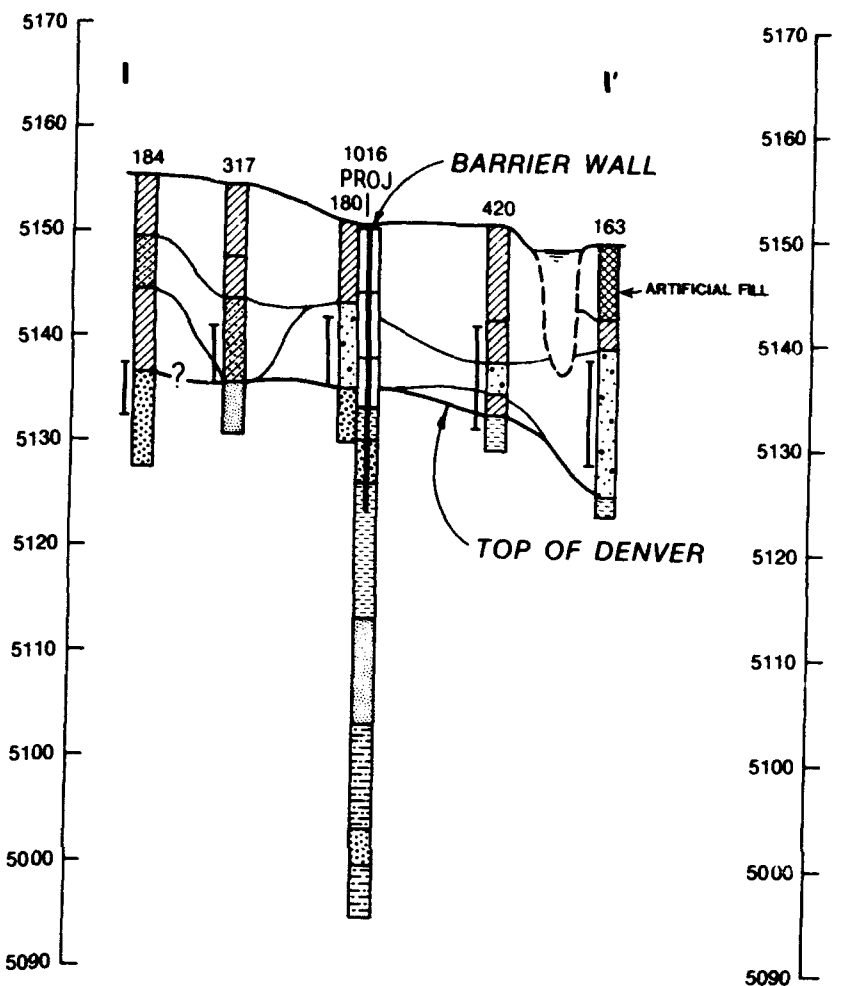
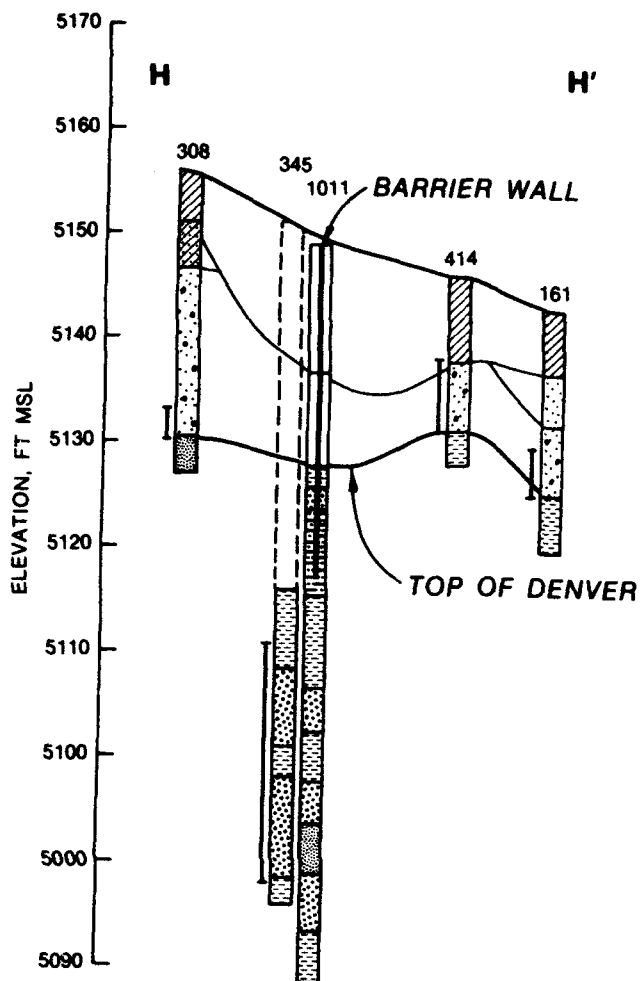


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DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 631 VICKSBURG, MS.	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
DESIGNED BY DATE DRAWN BY R. C. HUNT DATE FEB 1, 1985 REVIEWED BY B. ANDERSON DATE MAR 8, 1985 APPROVED BY J. H. MAY DATE MAR 8, 1985	NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM CROSS SECTIONS E-E', F-F' and G-G' DRAWING / No. PLATE G-07

(2)



LEGEND

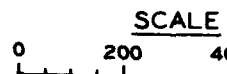
Alluvium (Unified Soil Classification)

- CH, Clay Flat
- CL, Clay, Silty Clay
- ML, Silt
- SC, Clayey Sand
- SM, Silty Sand
- SP, Sand
- SP-GP, Gravelly Sand

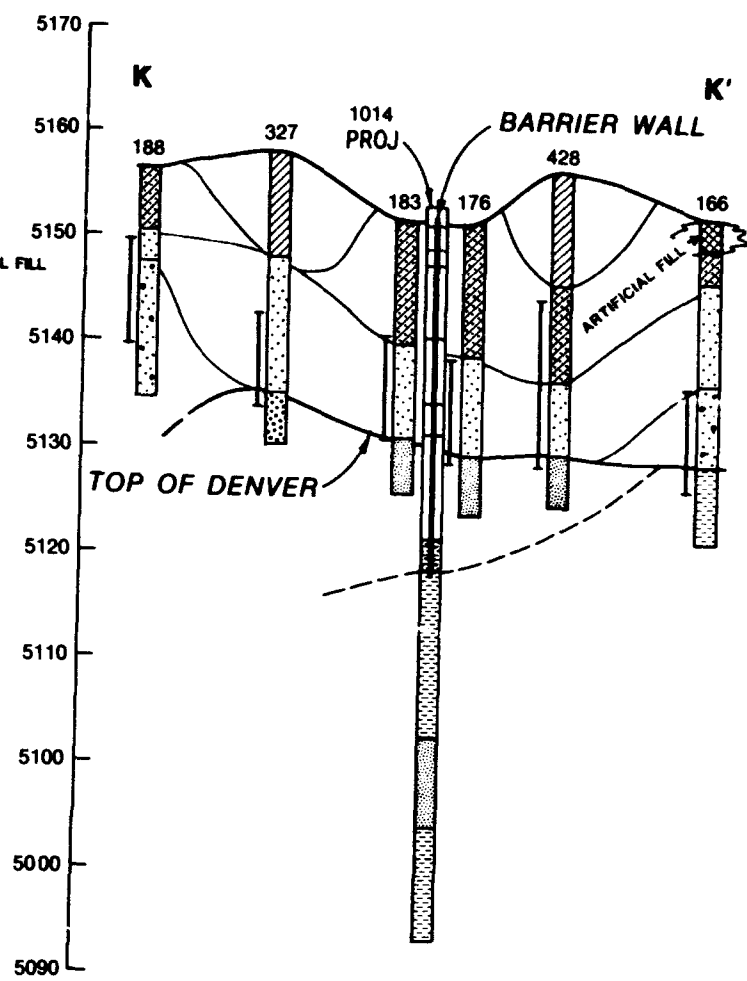
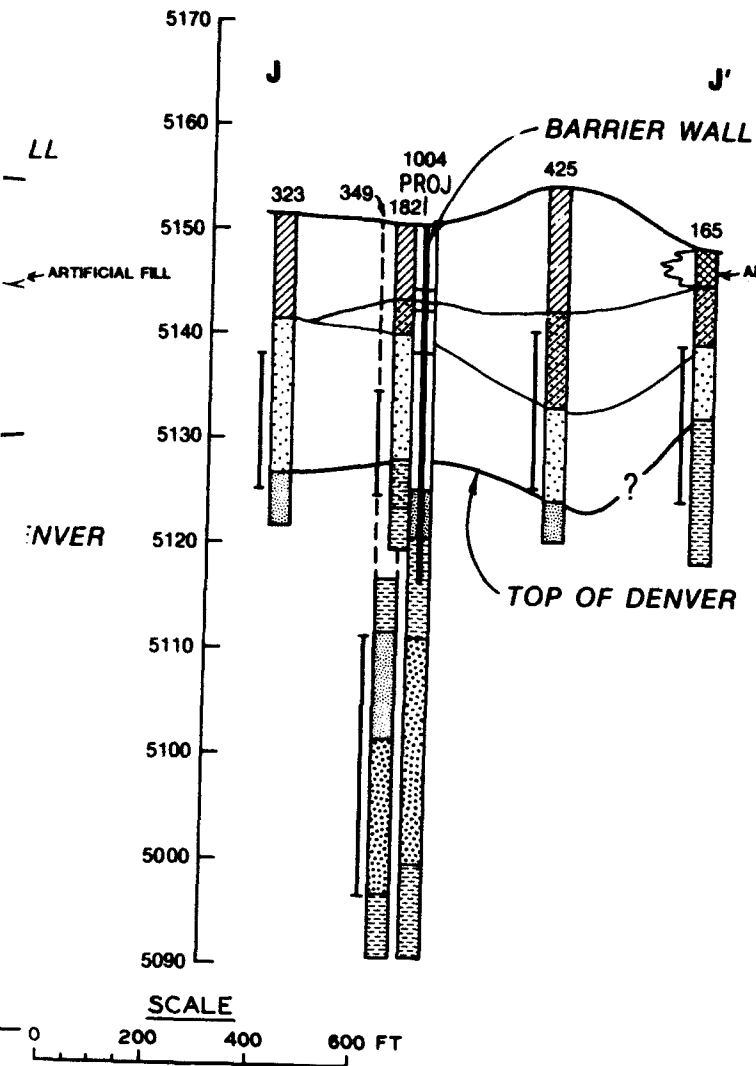
Denver

- Clayshale, Claystone
- Sandy Clayshale, Clayshale w/Sand-Silt Lenses
- Silt, Siltstone, Sandy Siltstone
- Sand, Sandstone, Silty Sandstone

SCREENED INTERVAL



①

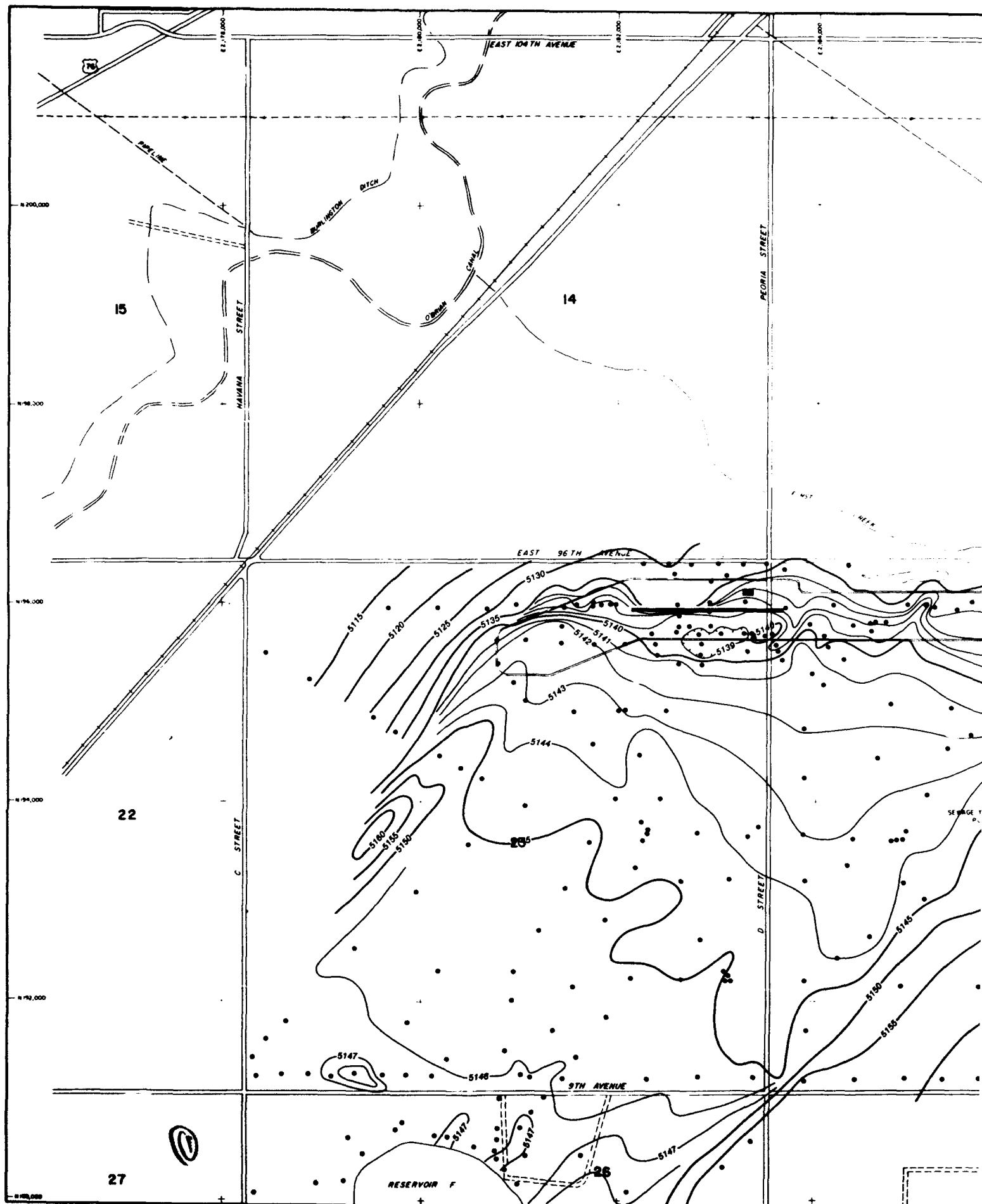


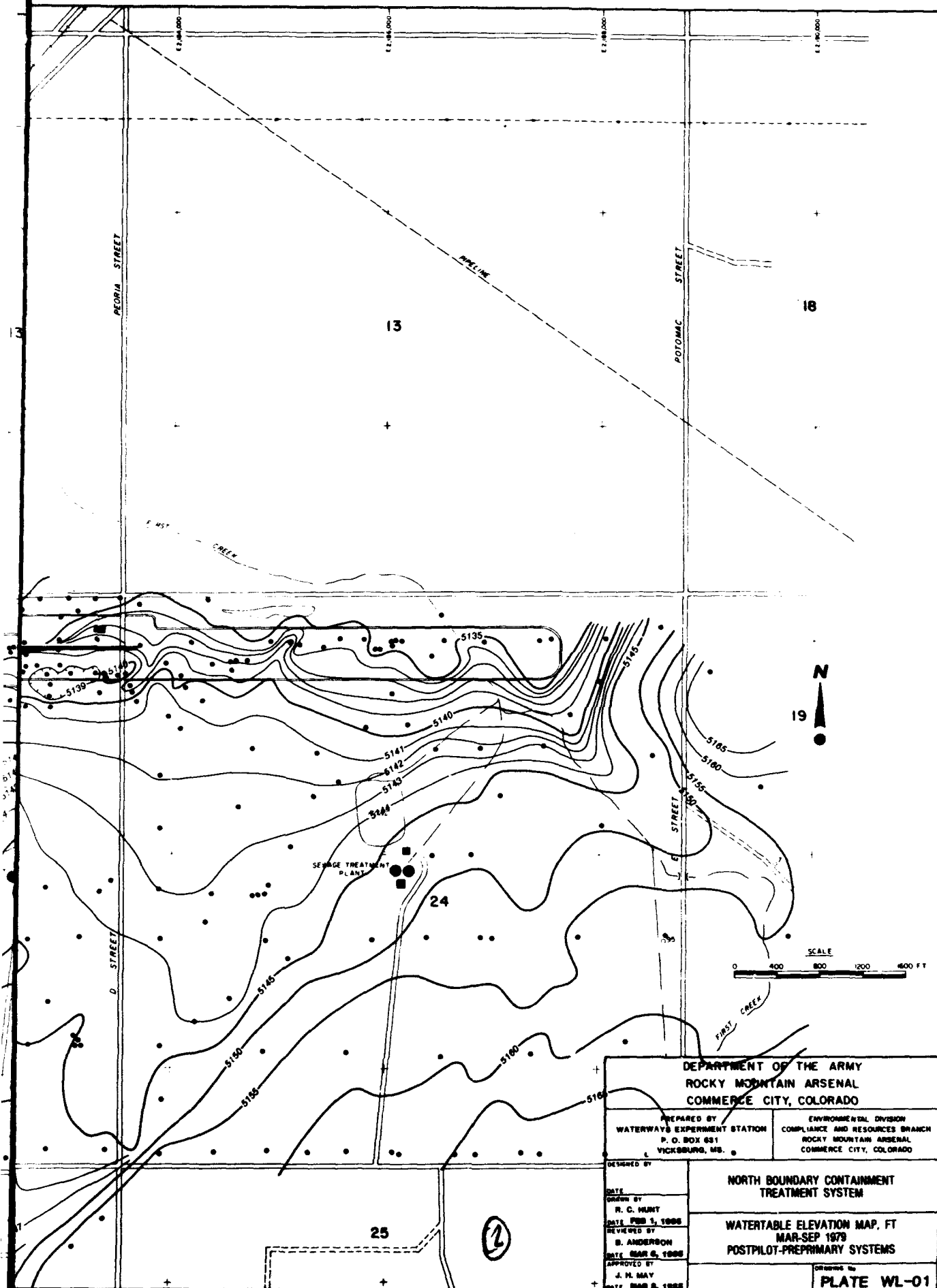
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<p>PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 631 VICKSBURG, MS.</p>	<p>ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO</p>
<p>DESIGNED BY</p>	<p align="center">NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM</p>
<p>DATE</p>	
<p>DRAWN BY R. C. HUNT</p>	<p align="center">CROSS SECTIONS H-H', I-I', J-J' and K-K'</p>
<p>DATE FEB 1, 1985</p>	
<p>REVIEWED BY B. ANDERSON</p>	<p>DRAWING No. PLATE G-08</p>
<p>DATE MAR 8, 1985</p>	
<p>APPROVED BY J. H. MAY</p>	
<p>DATE MAR 8, 1985</p>	

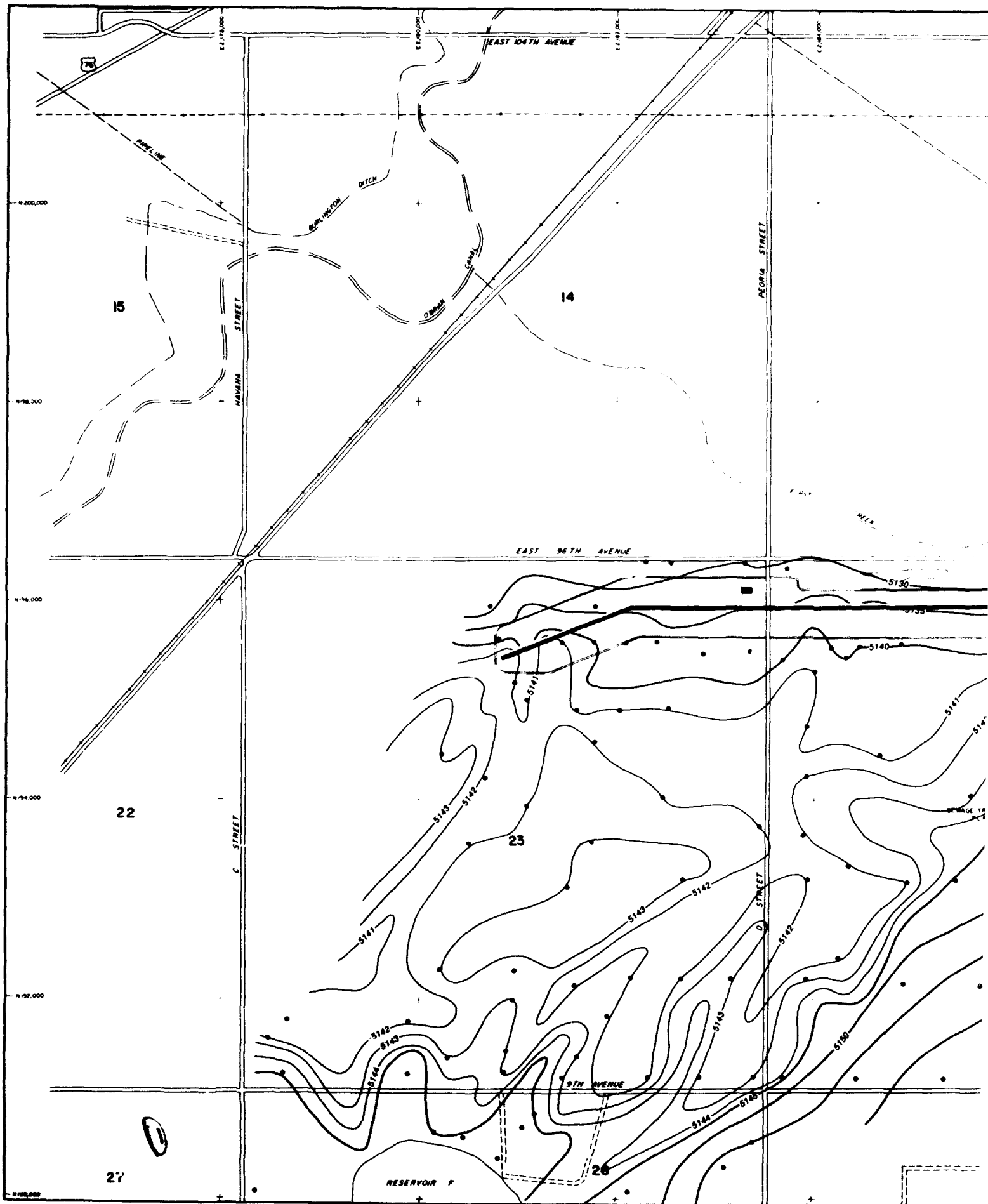
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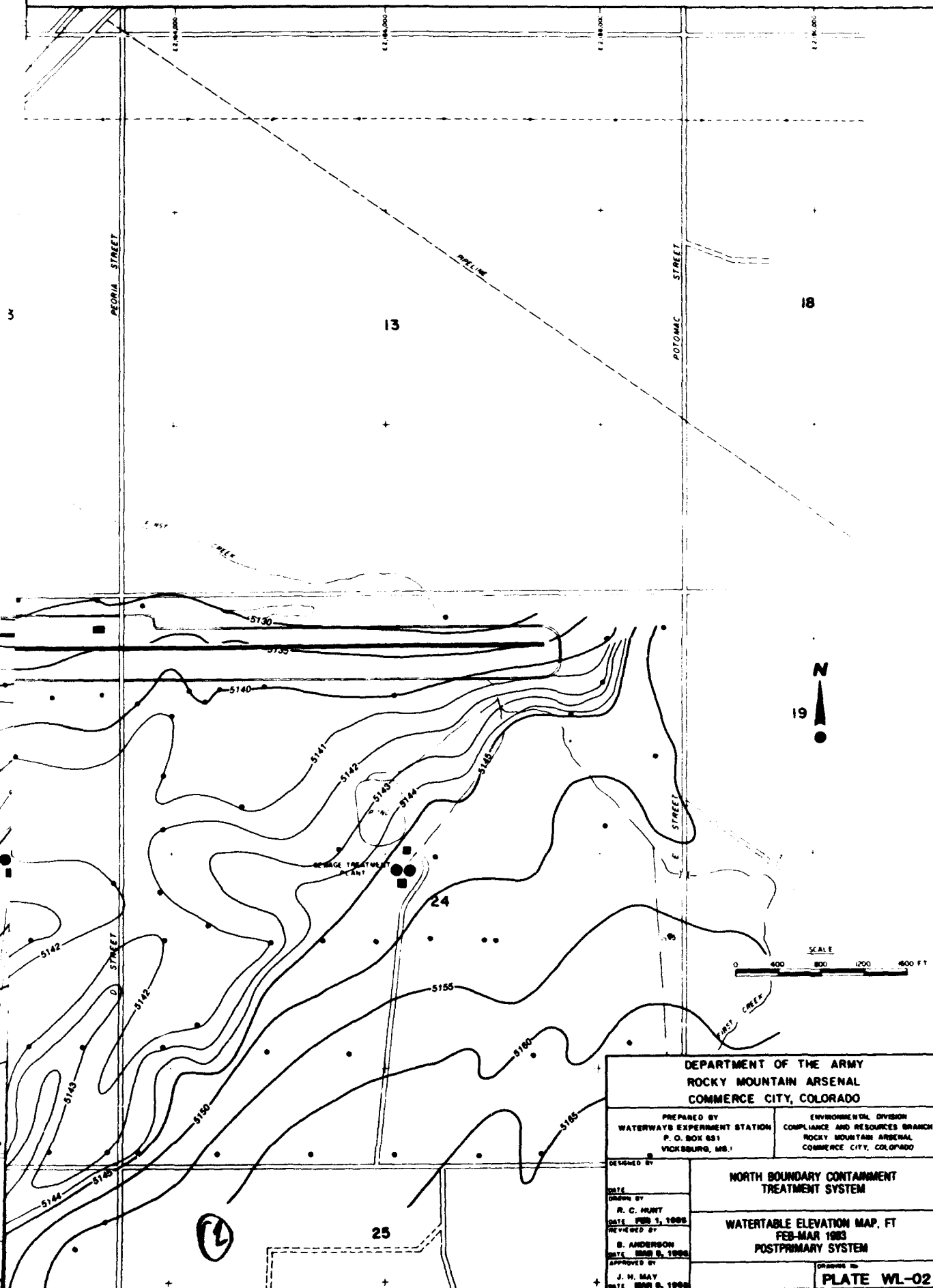
HYDROLOGY PLATES

WL-01 thru WL-05









DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
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ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

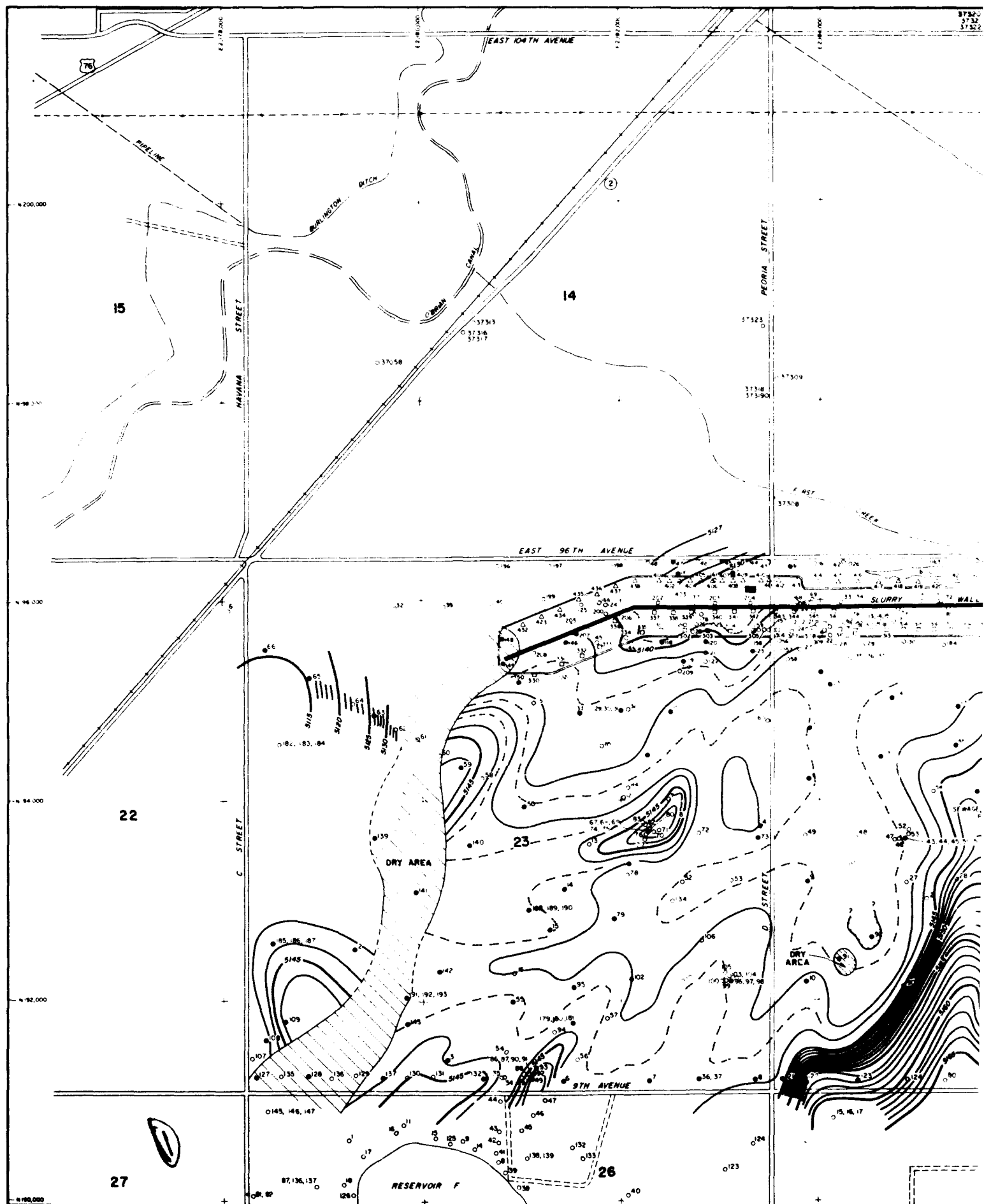
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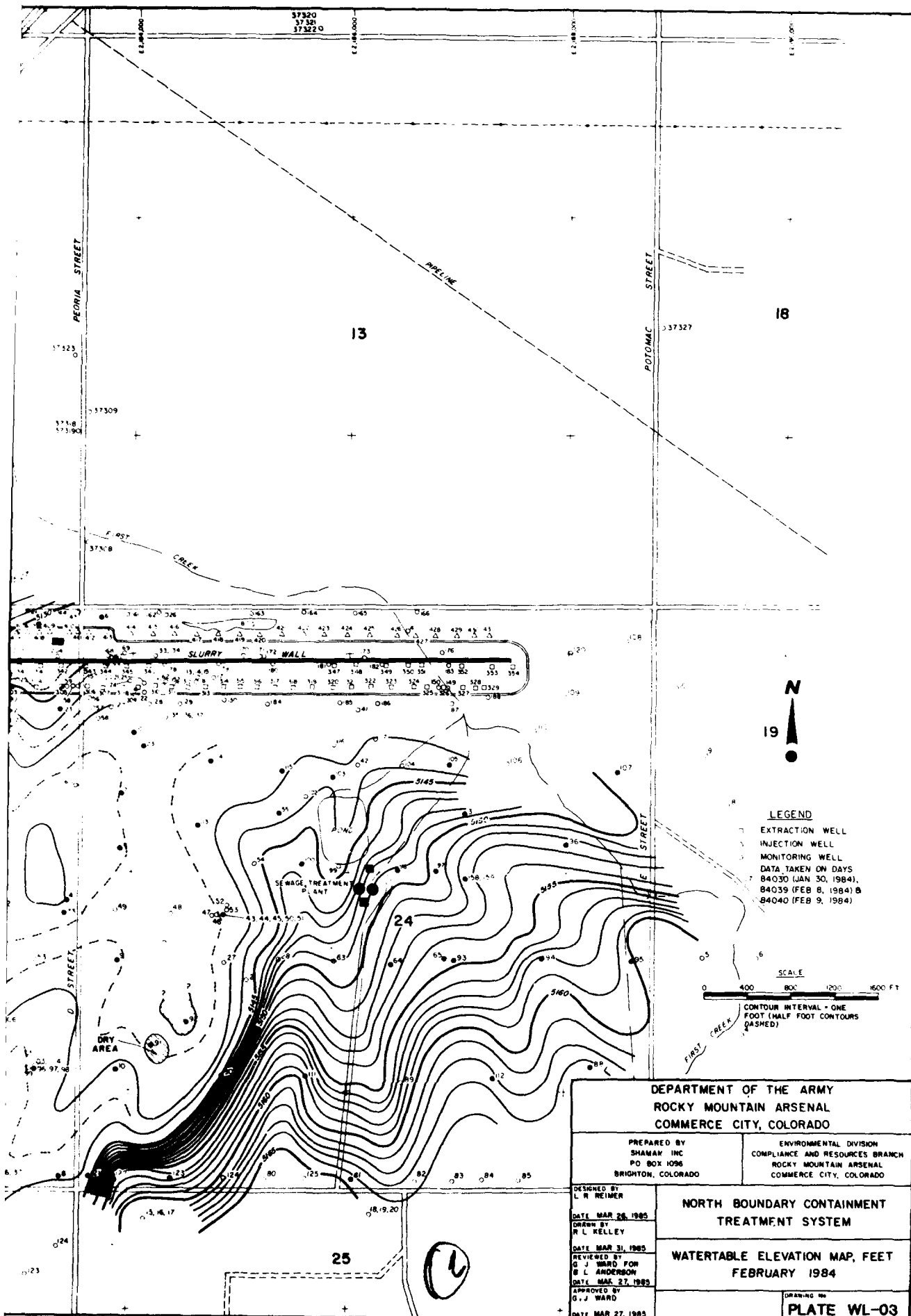
NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM

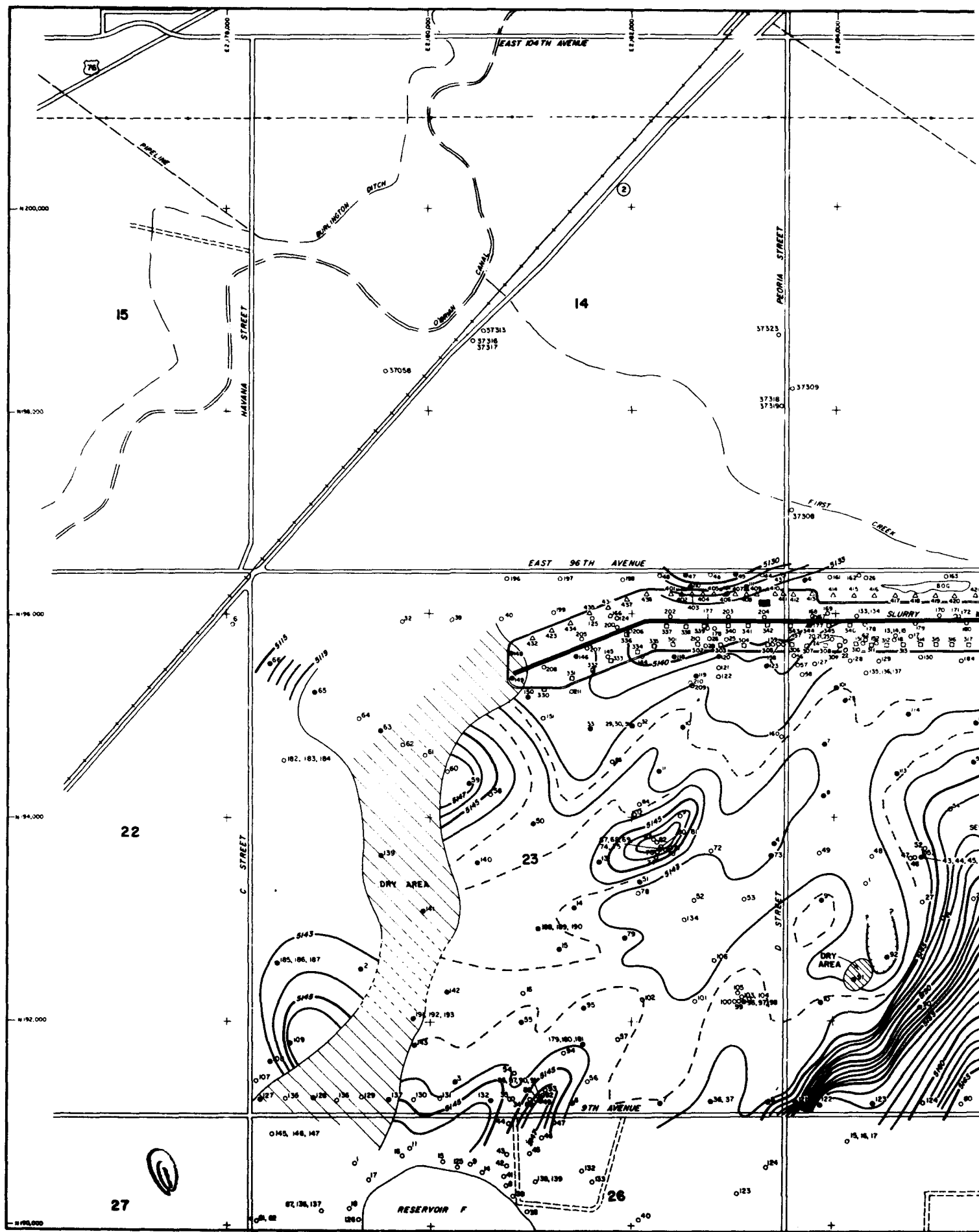
DATE
DRAWN BY
R. C. HUNT
DATE FEB 5, 1988
REVIEWED BY
B. ANDERSON
DATE MAR 5, 1988
APPROVED BY
J. H. MAY
DATE MAR 5, 1988

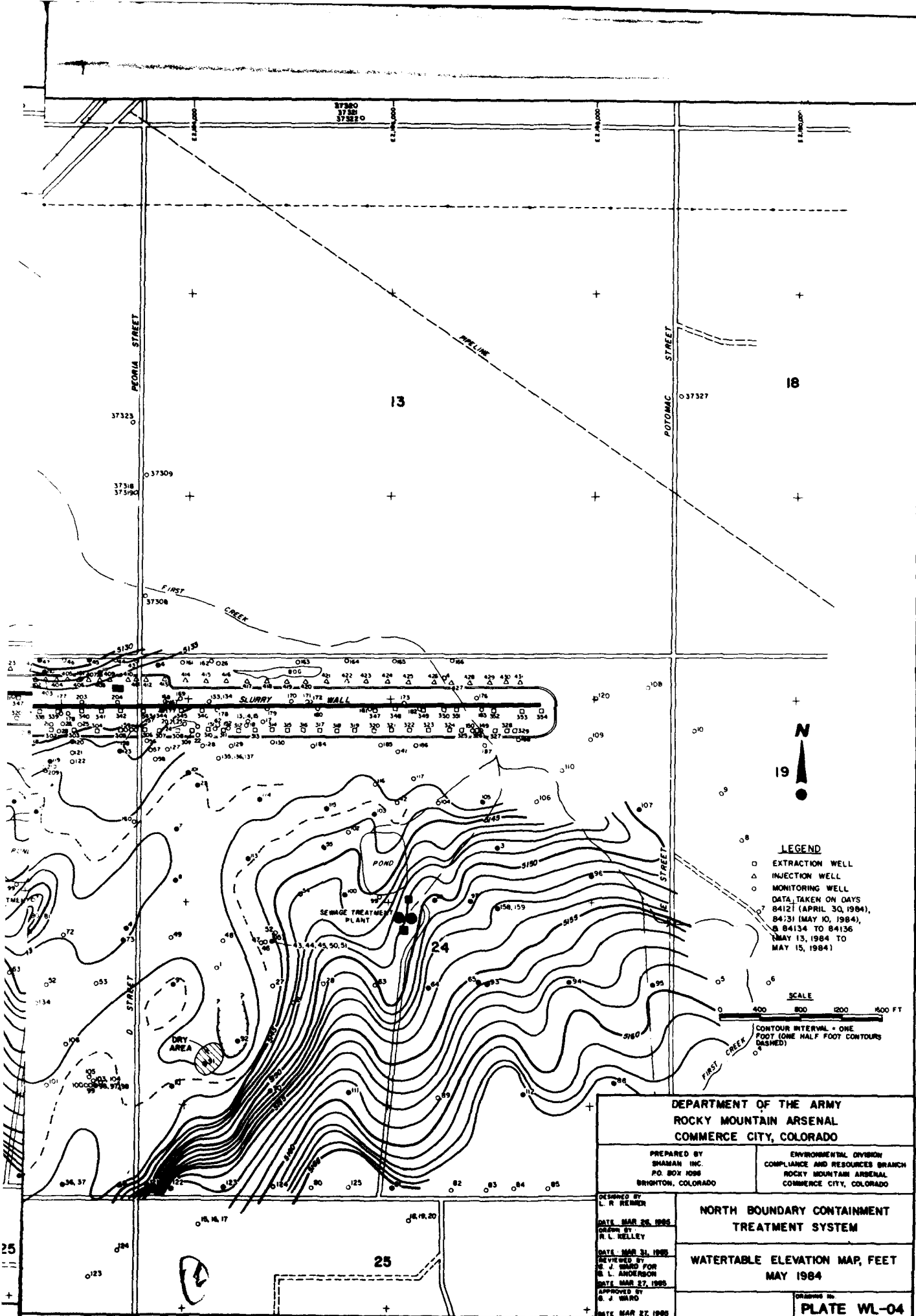
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FEB-MAR 1983
POSTPRIMARY SYSTEM

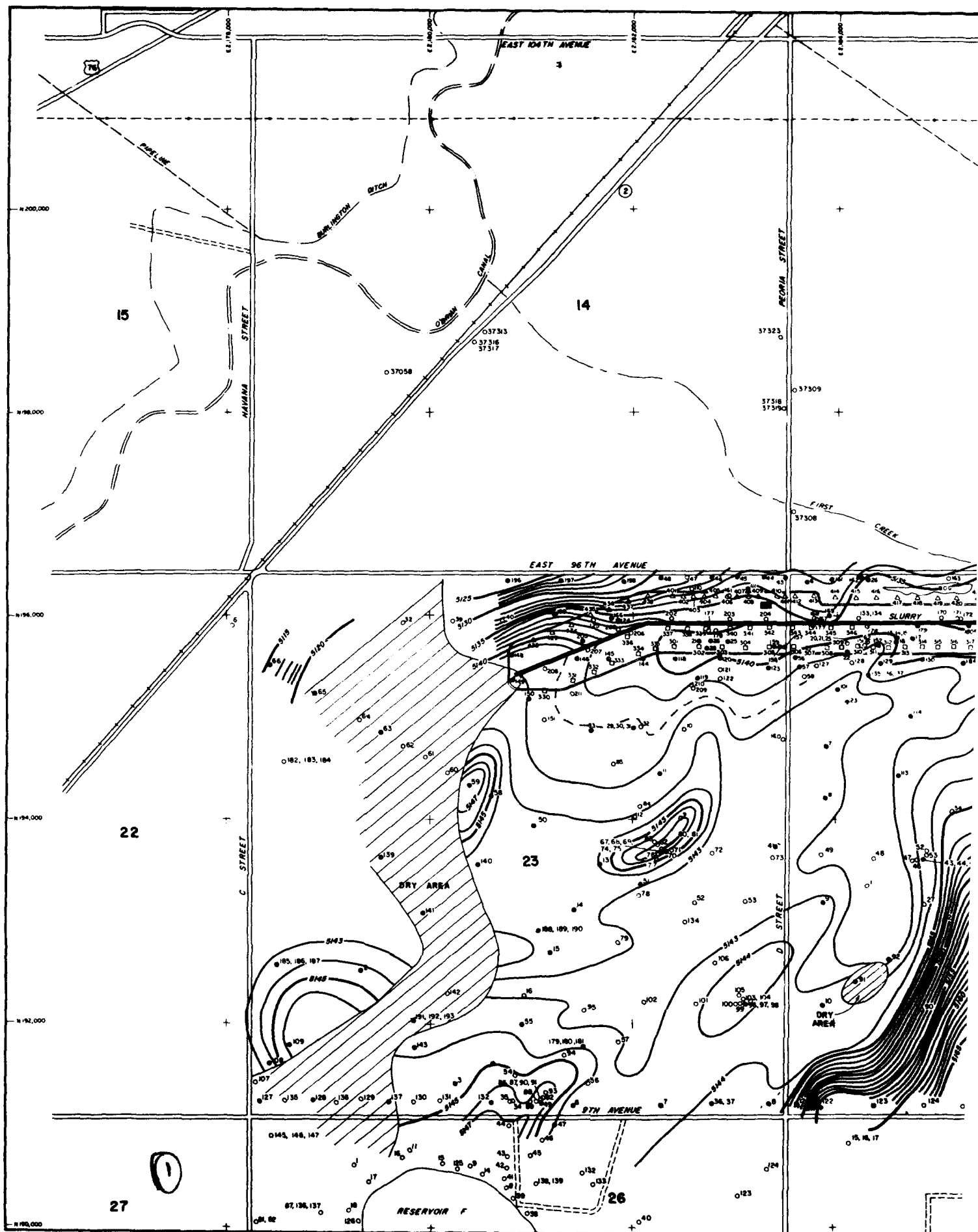
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PLATE WL-02

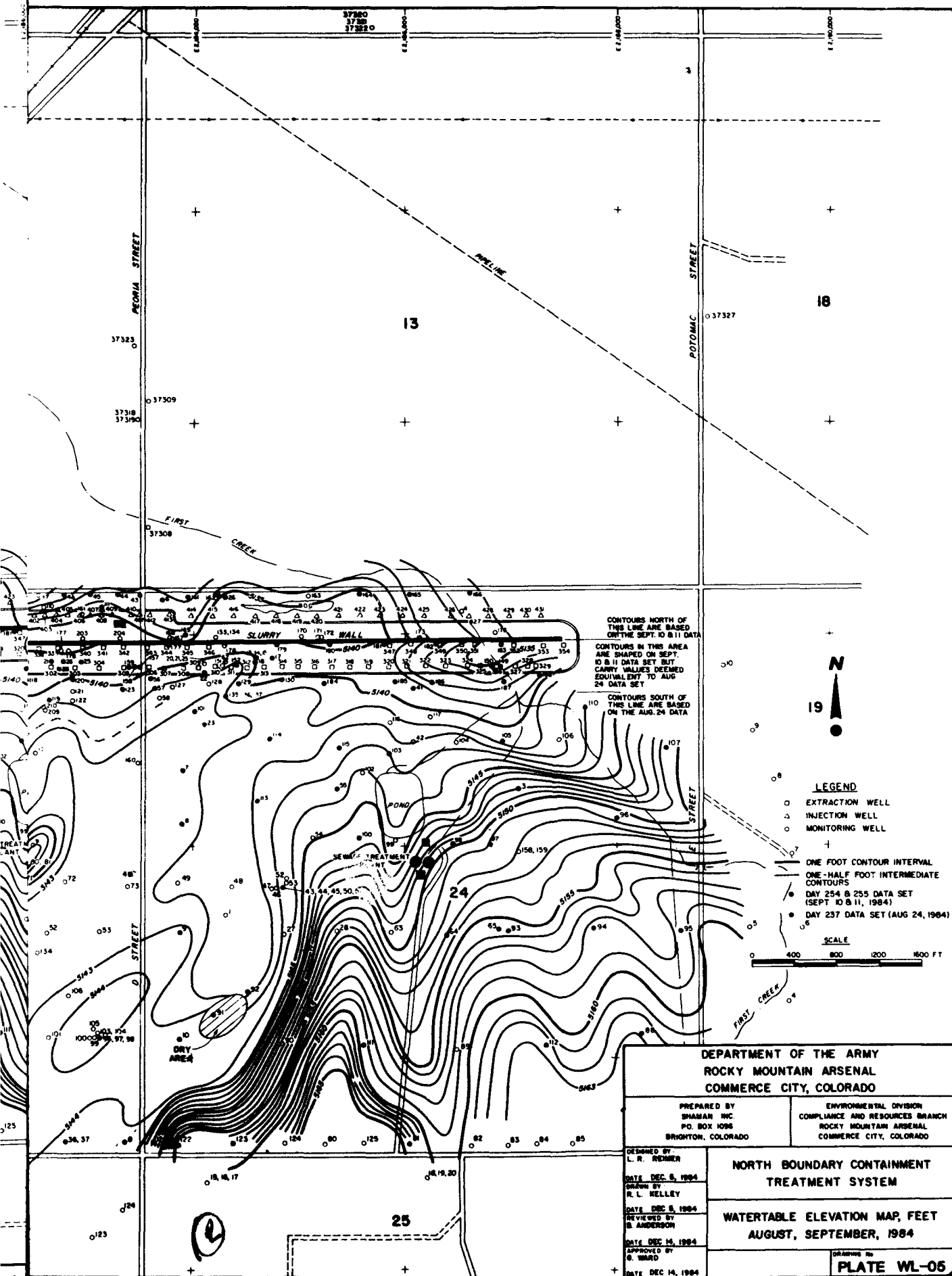






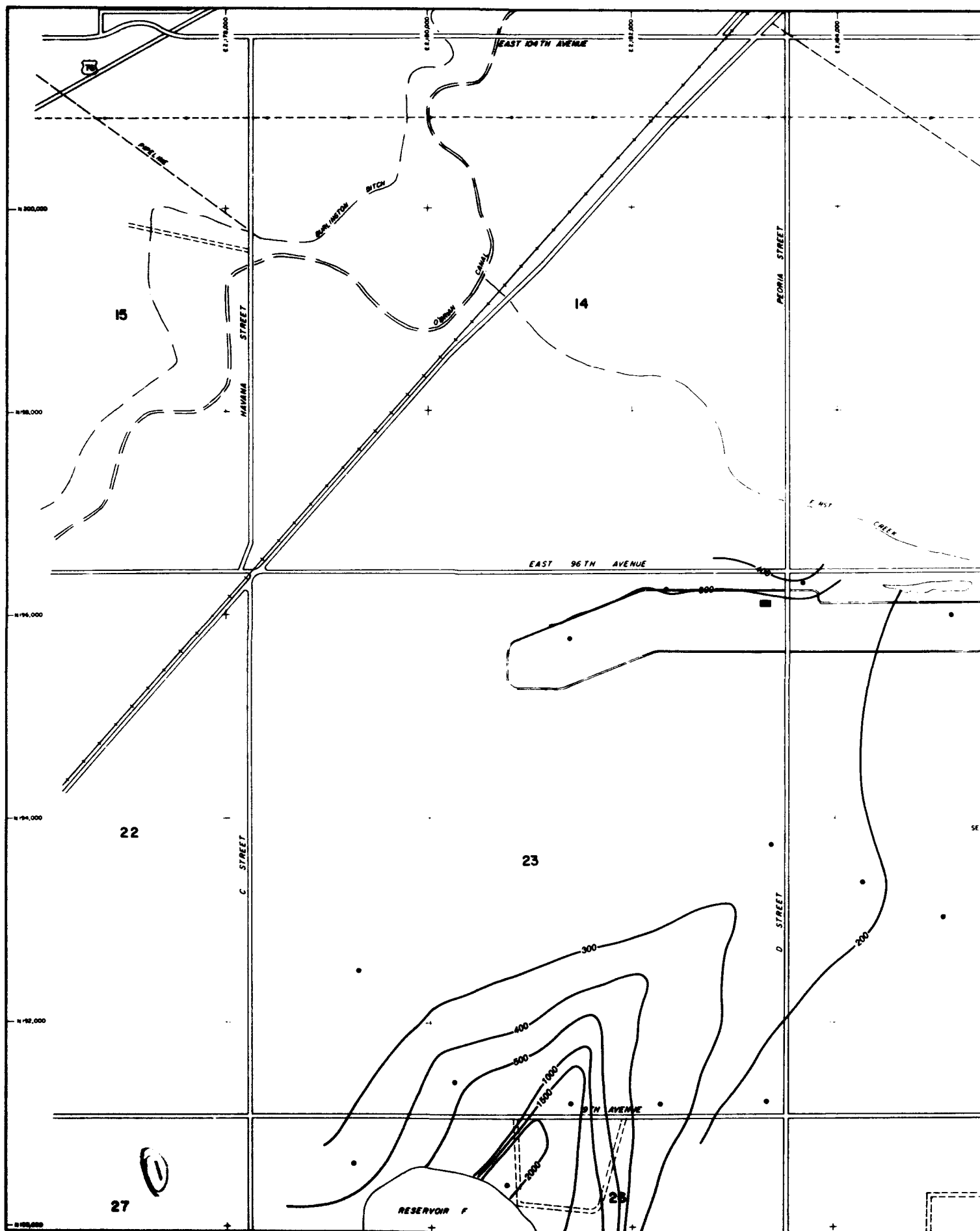


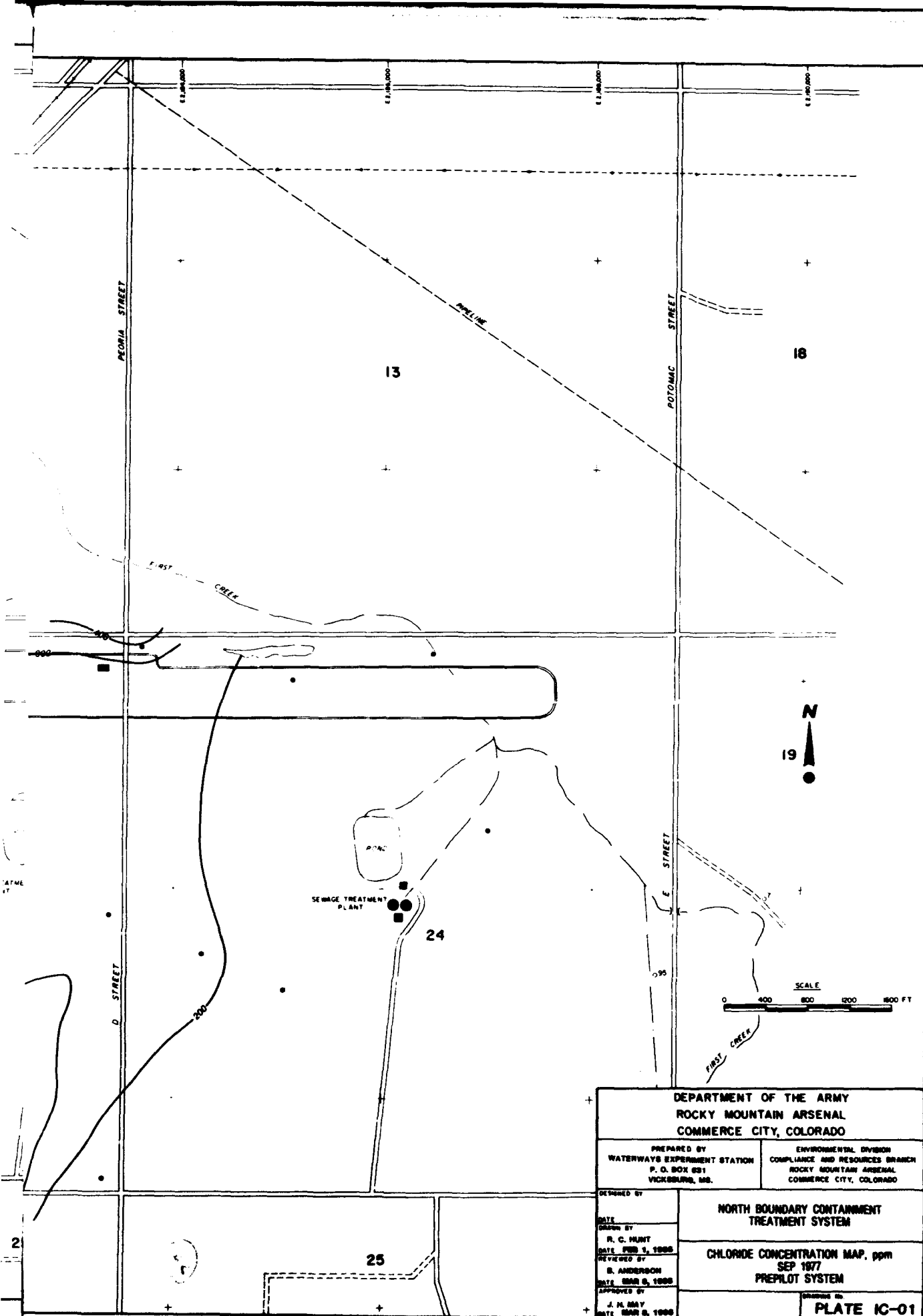


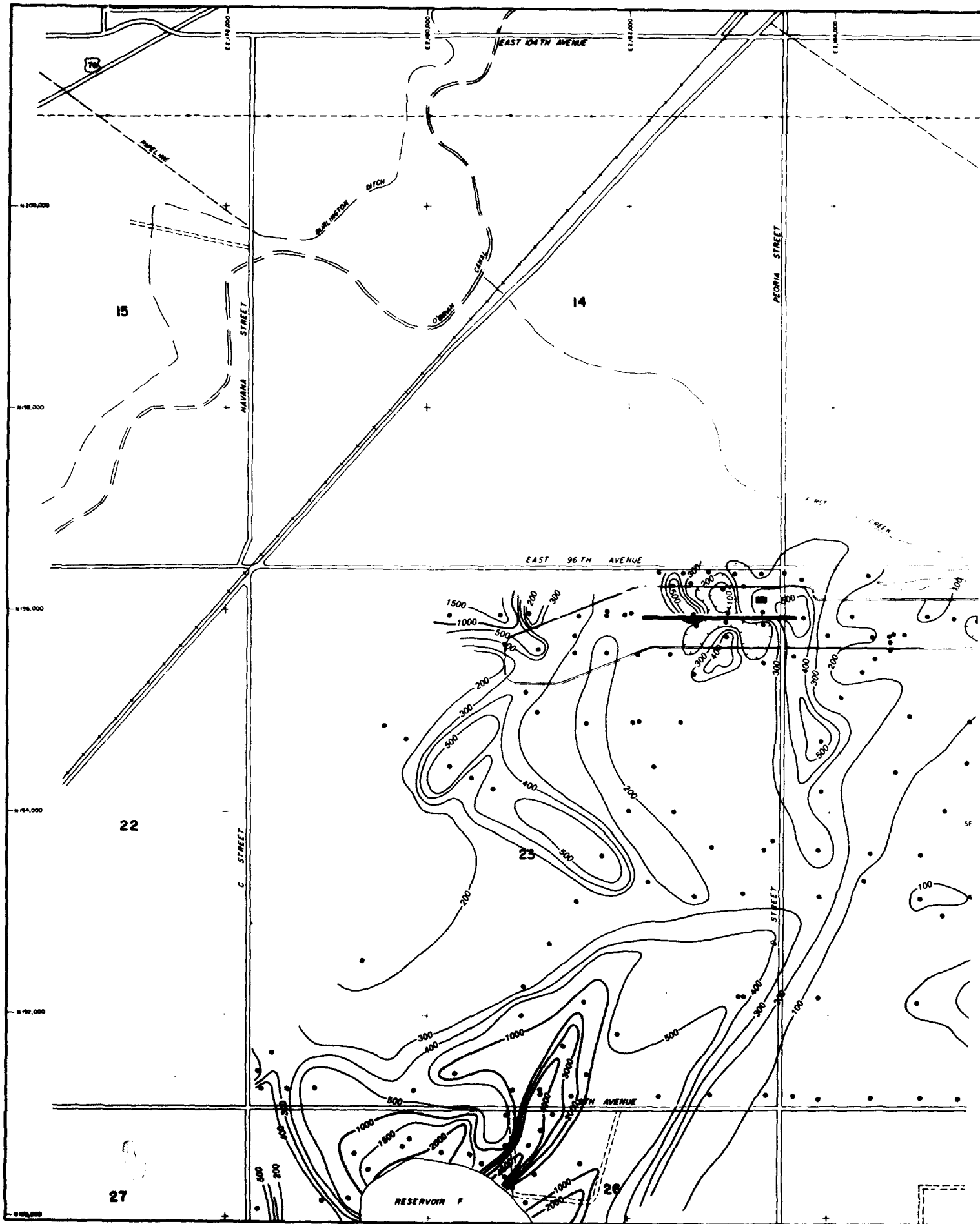


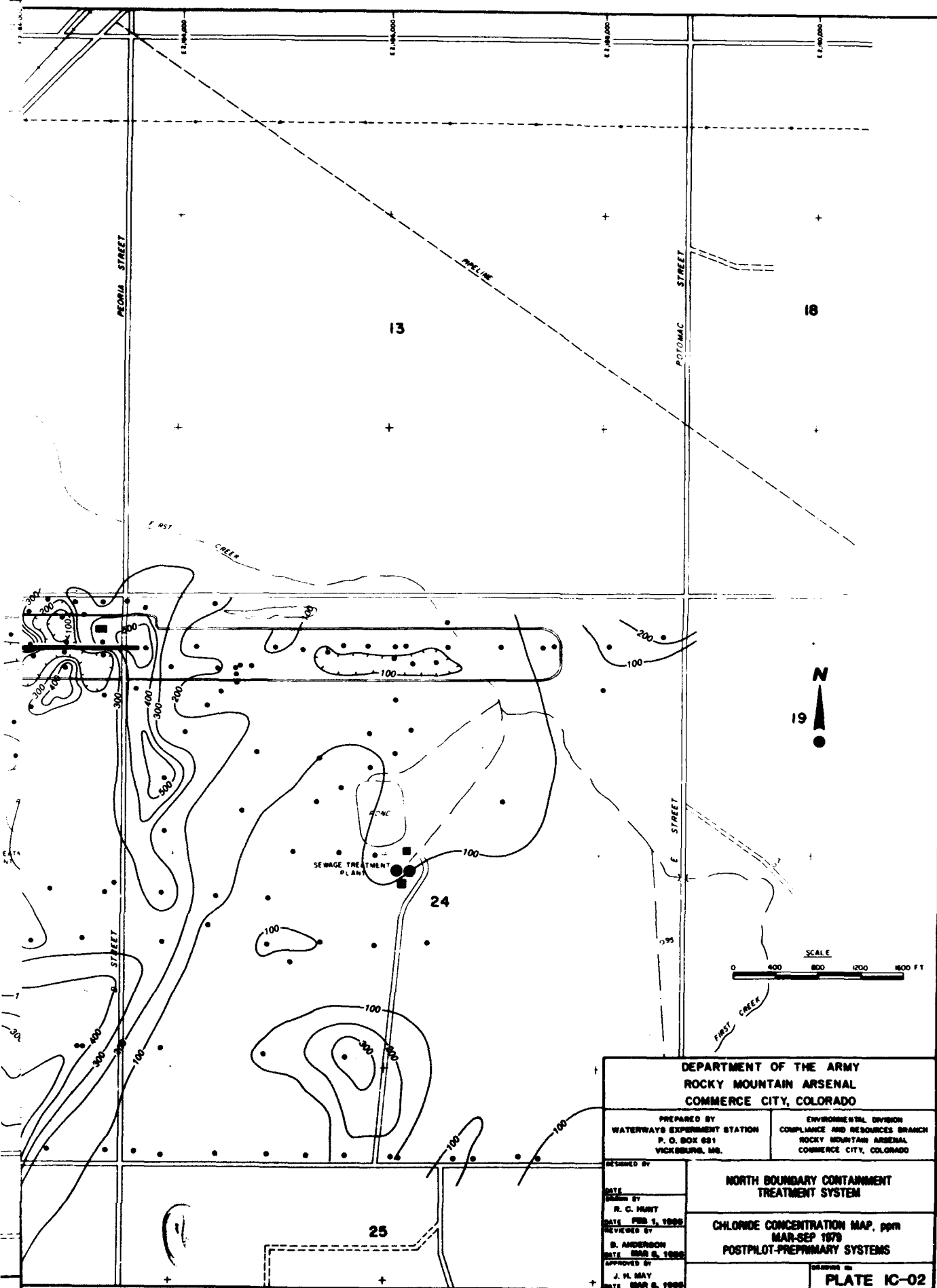
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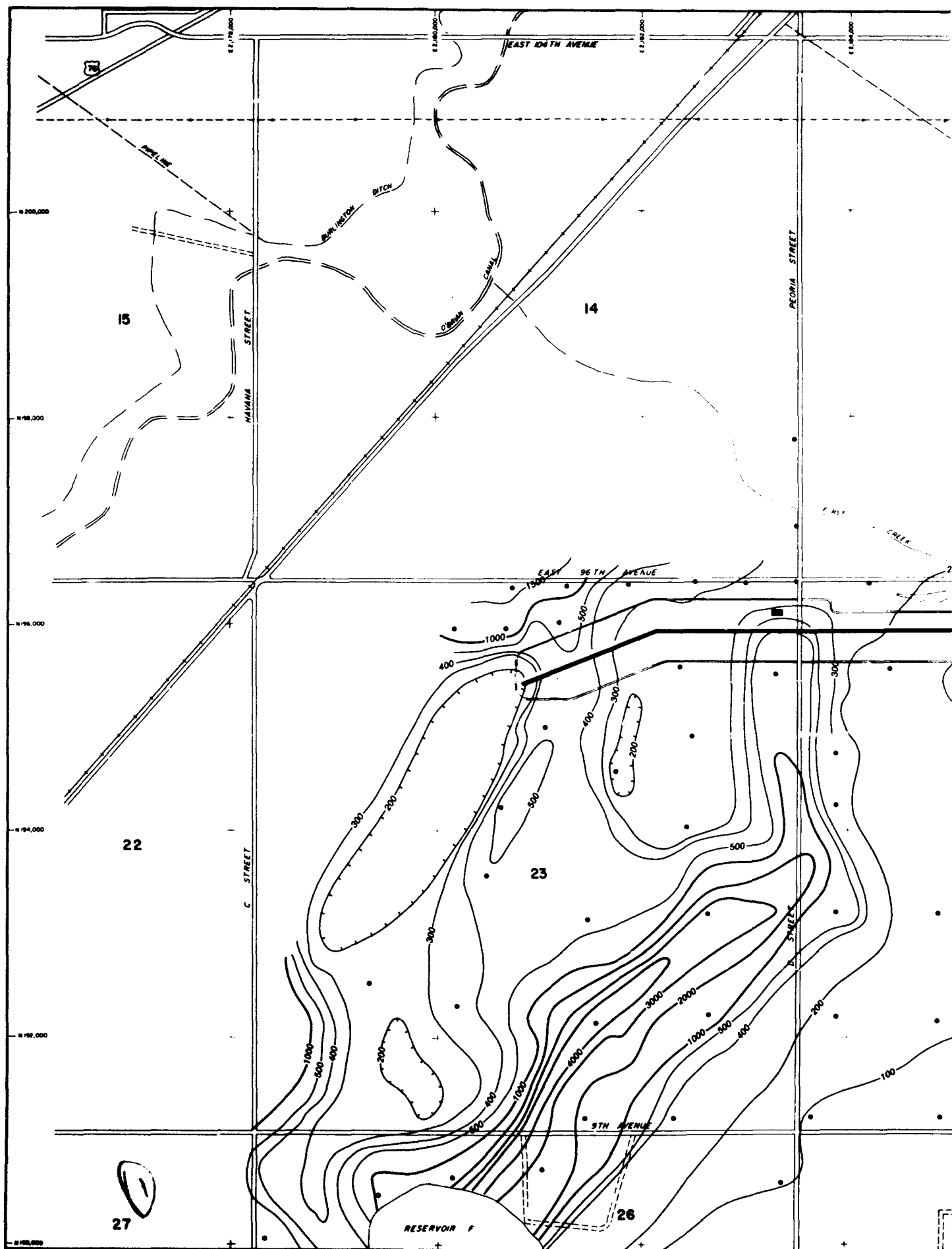
IC-01 thru IC-47

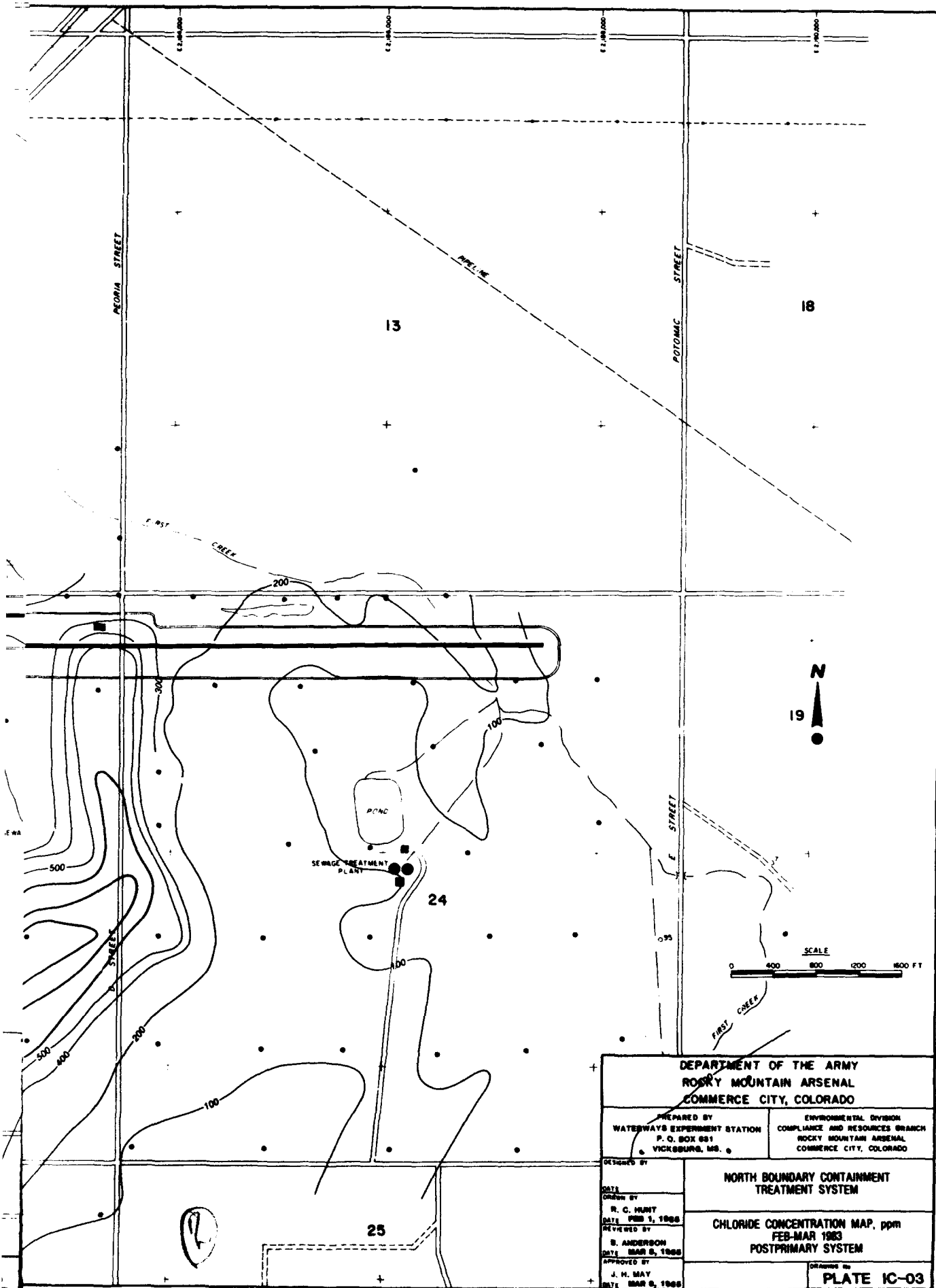




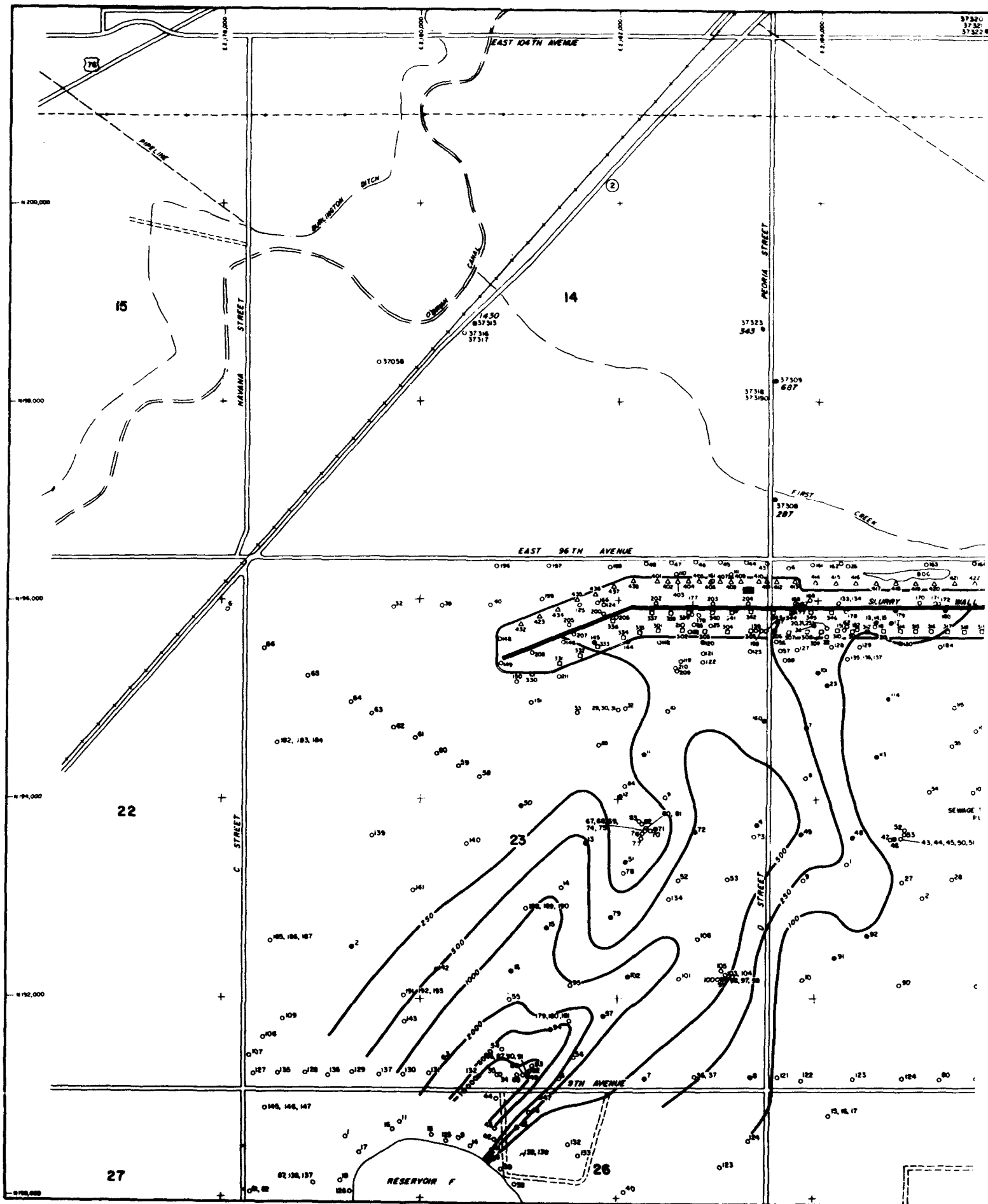


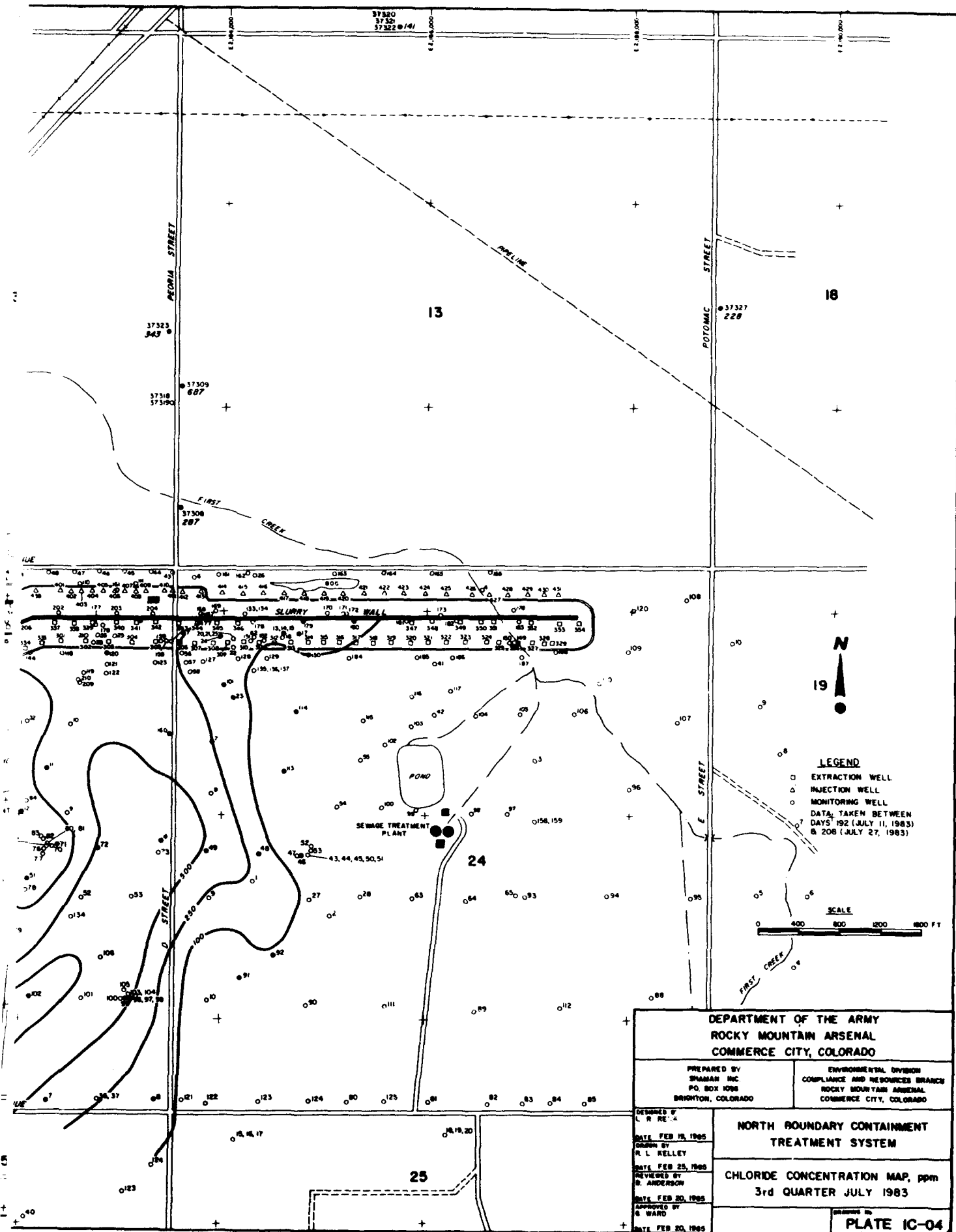


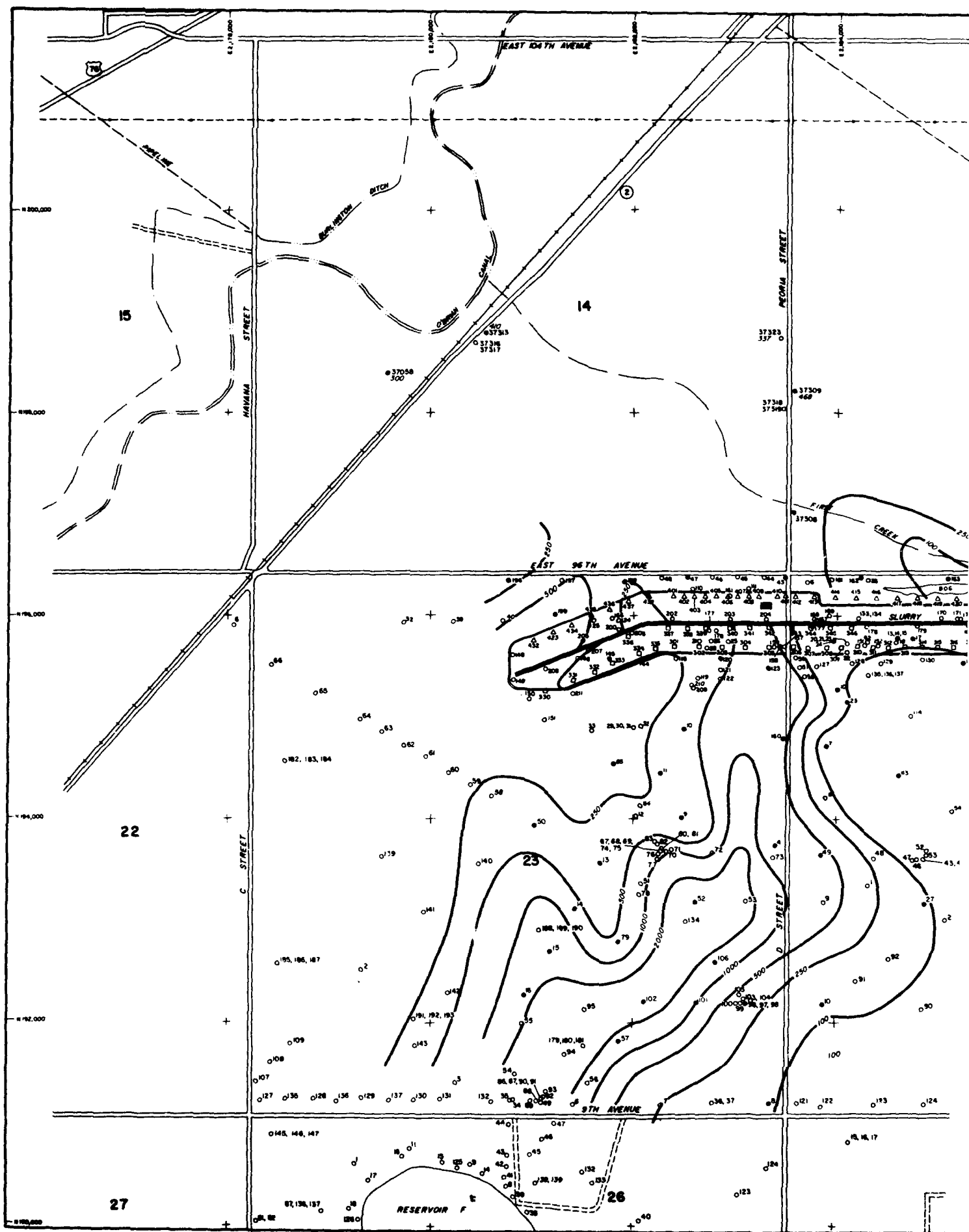


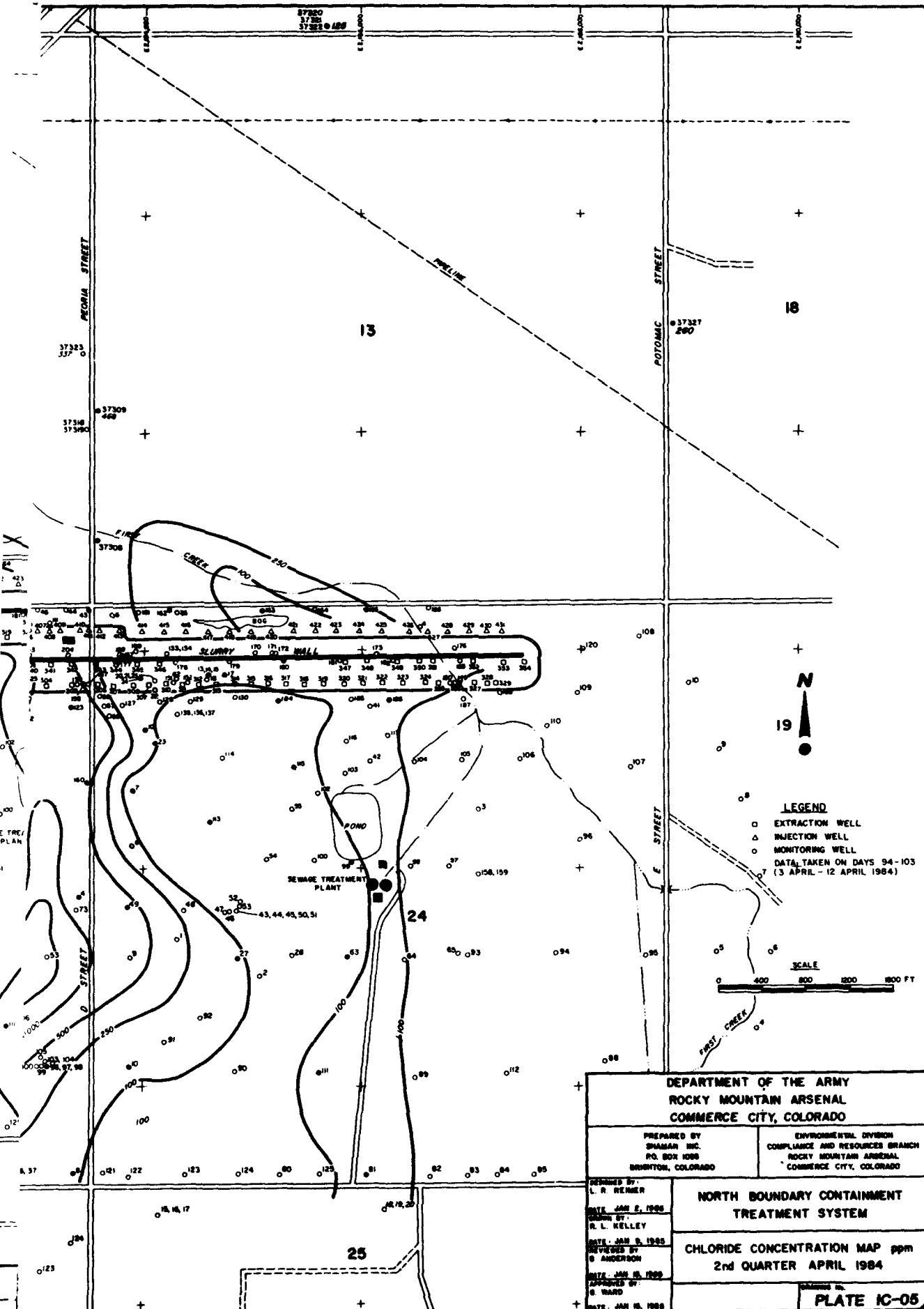


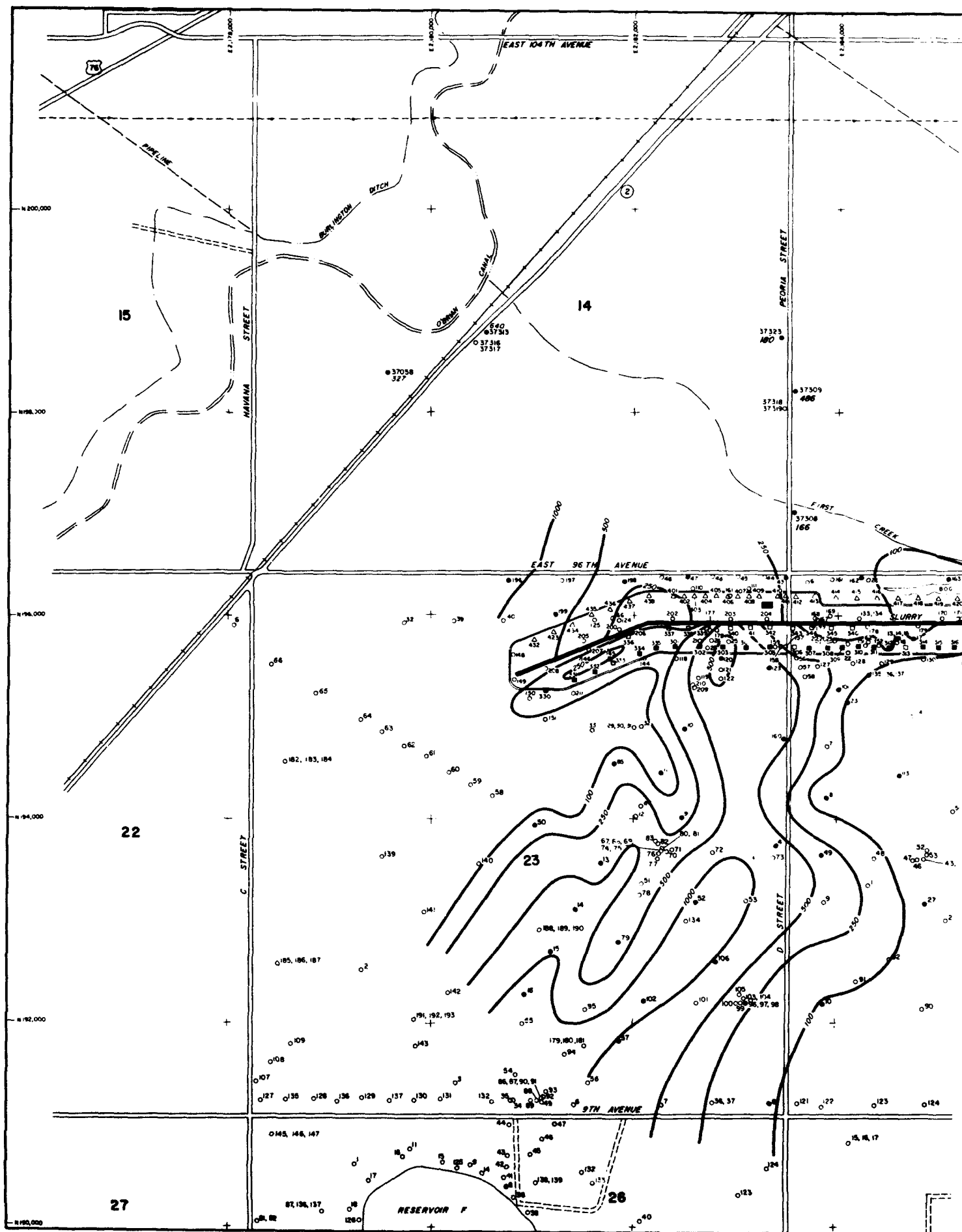
DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 881 VICKSBURG, MS.	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM	
CHLORIDE CONCENTRATION MAP, ppm FEB-MAR 1983 POSTPRIMARY SYSTEM	
DESIGNED BY DATE DRAWN BY R. C. HUNT DATE FEB 1, 1983 REVIEWED BY S. ANDERSON DATE MAR 8, 1983 APPROVED BY J. H. MAY DATE MAR 8, 1983	DRAWING NO. PLATE IC-03

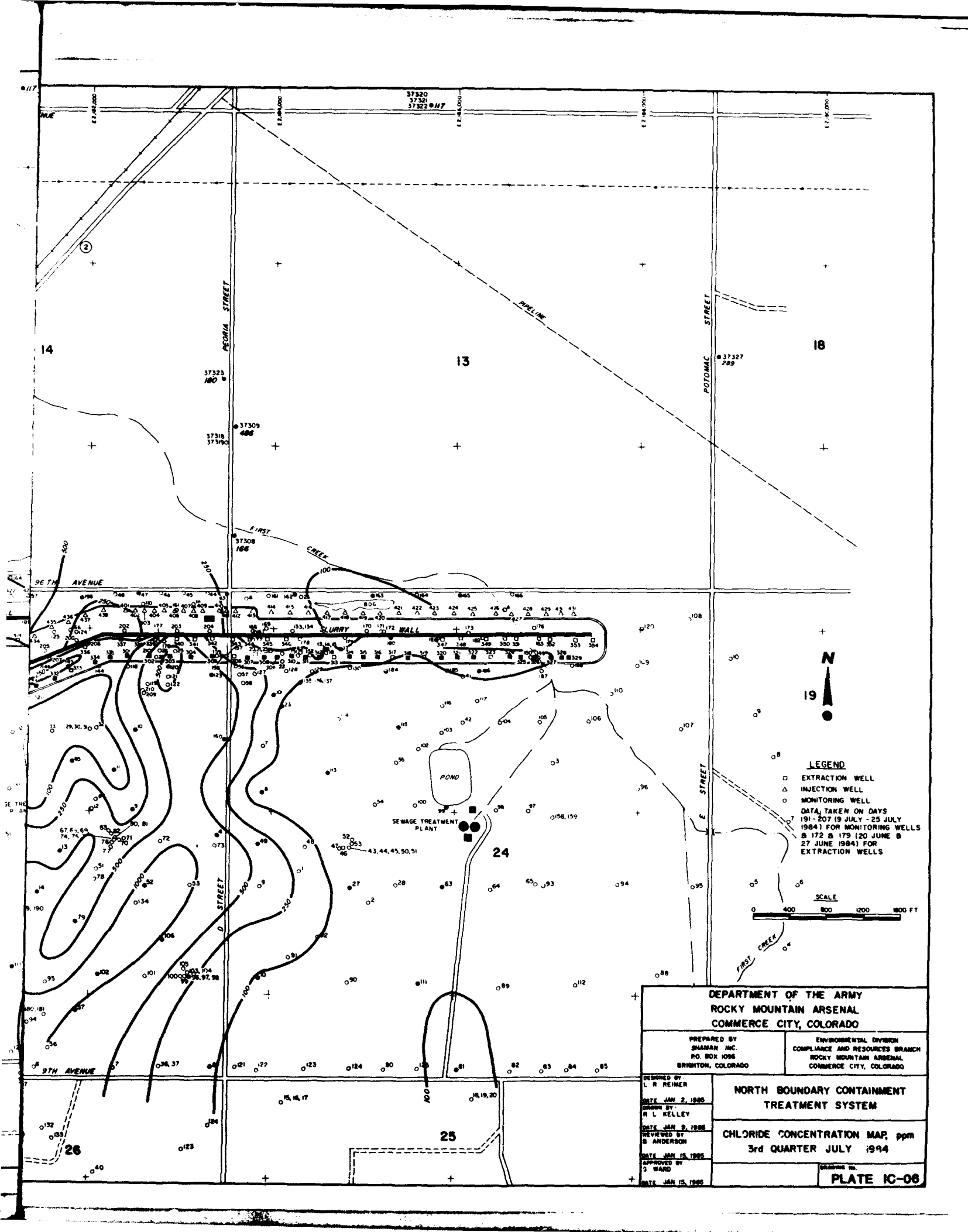


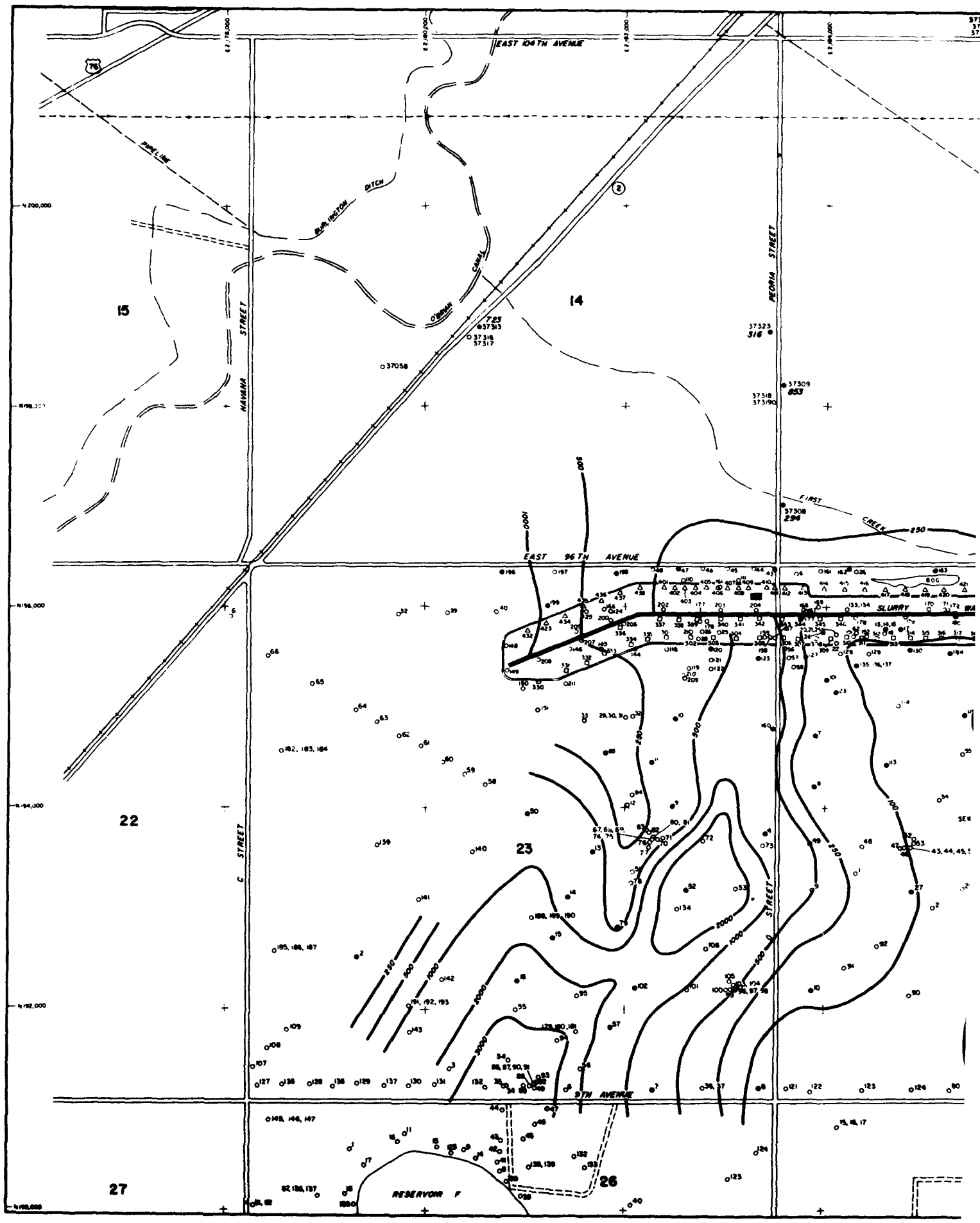


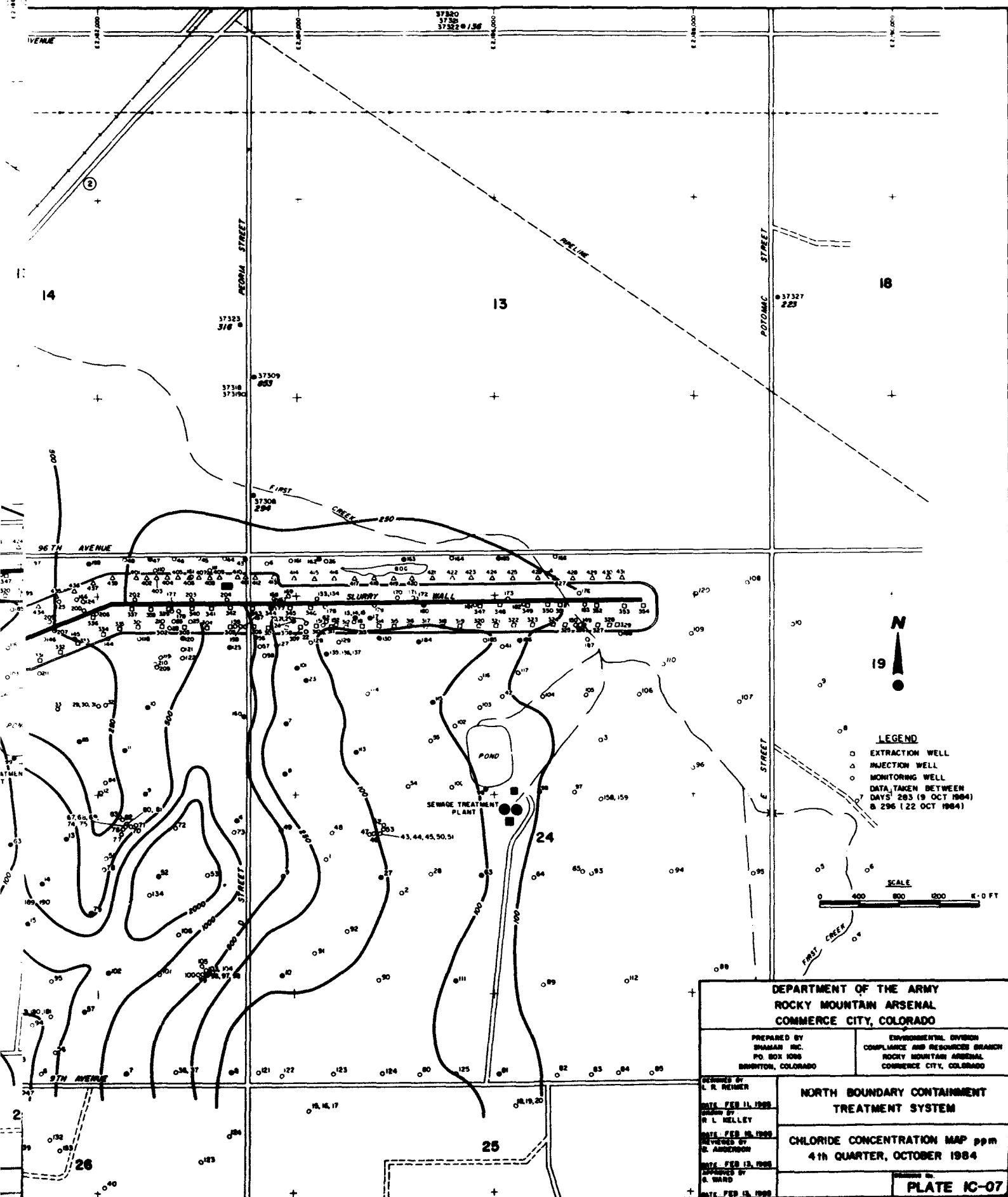


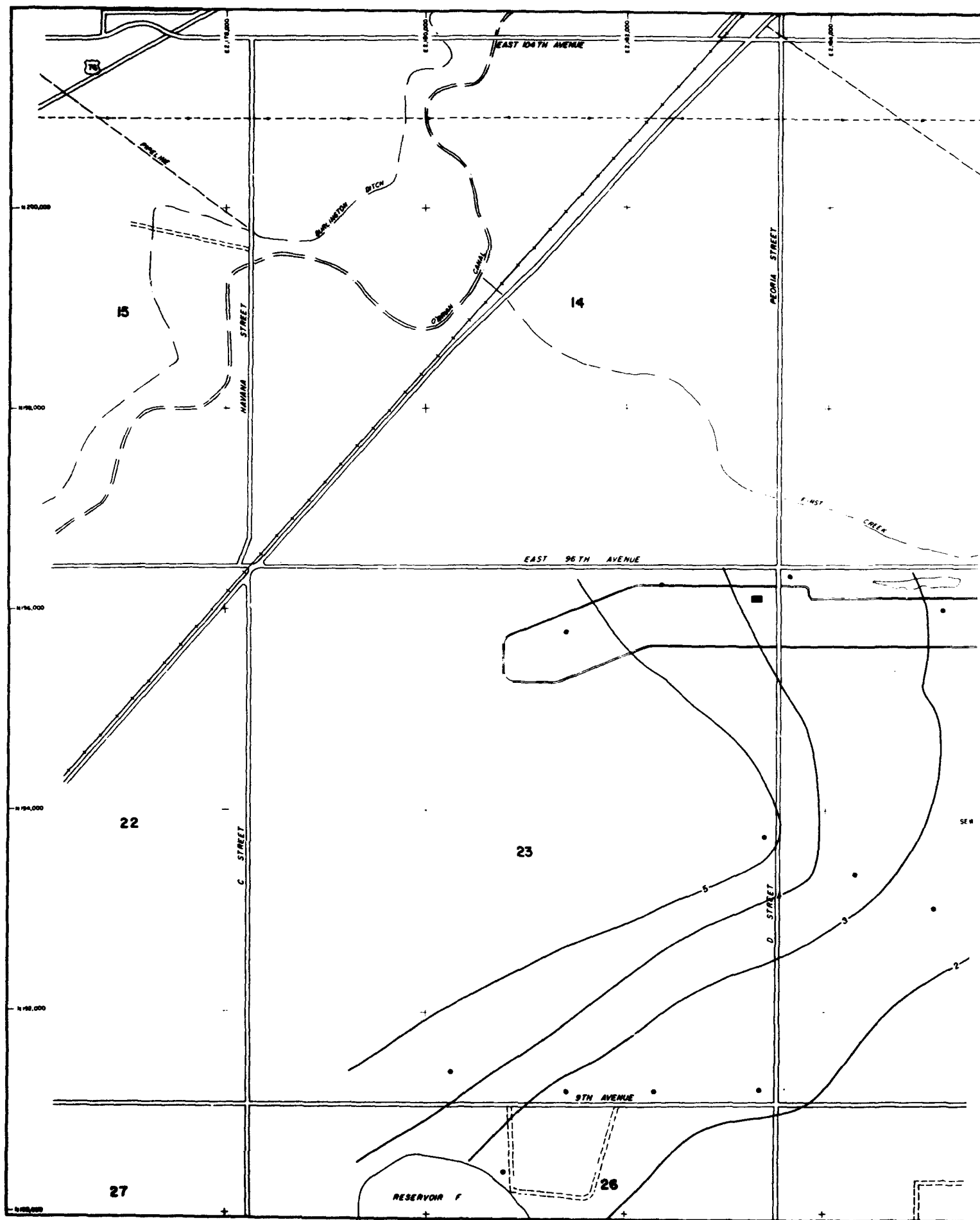


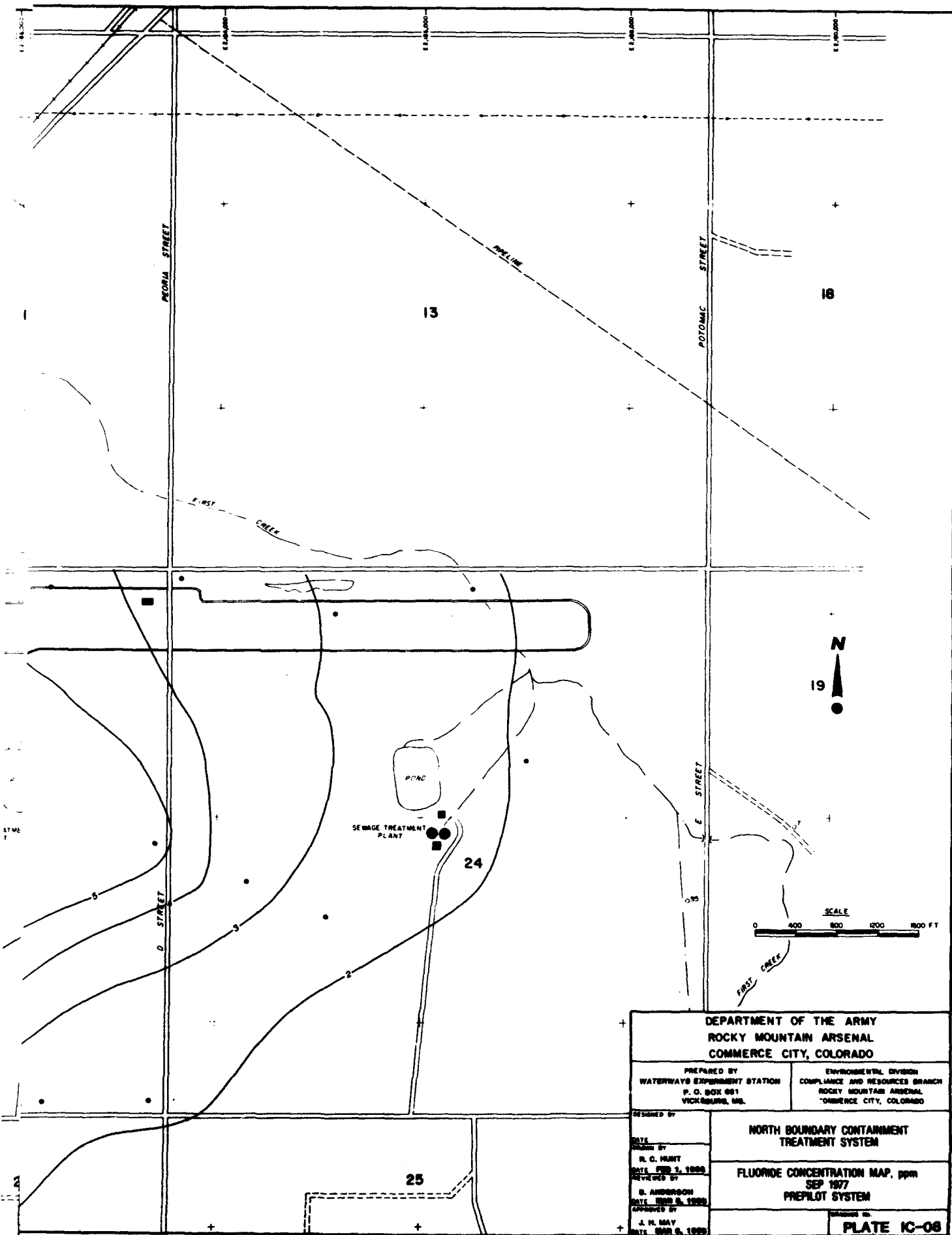


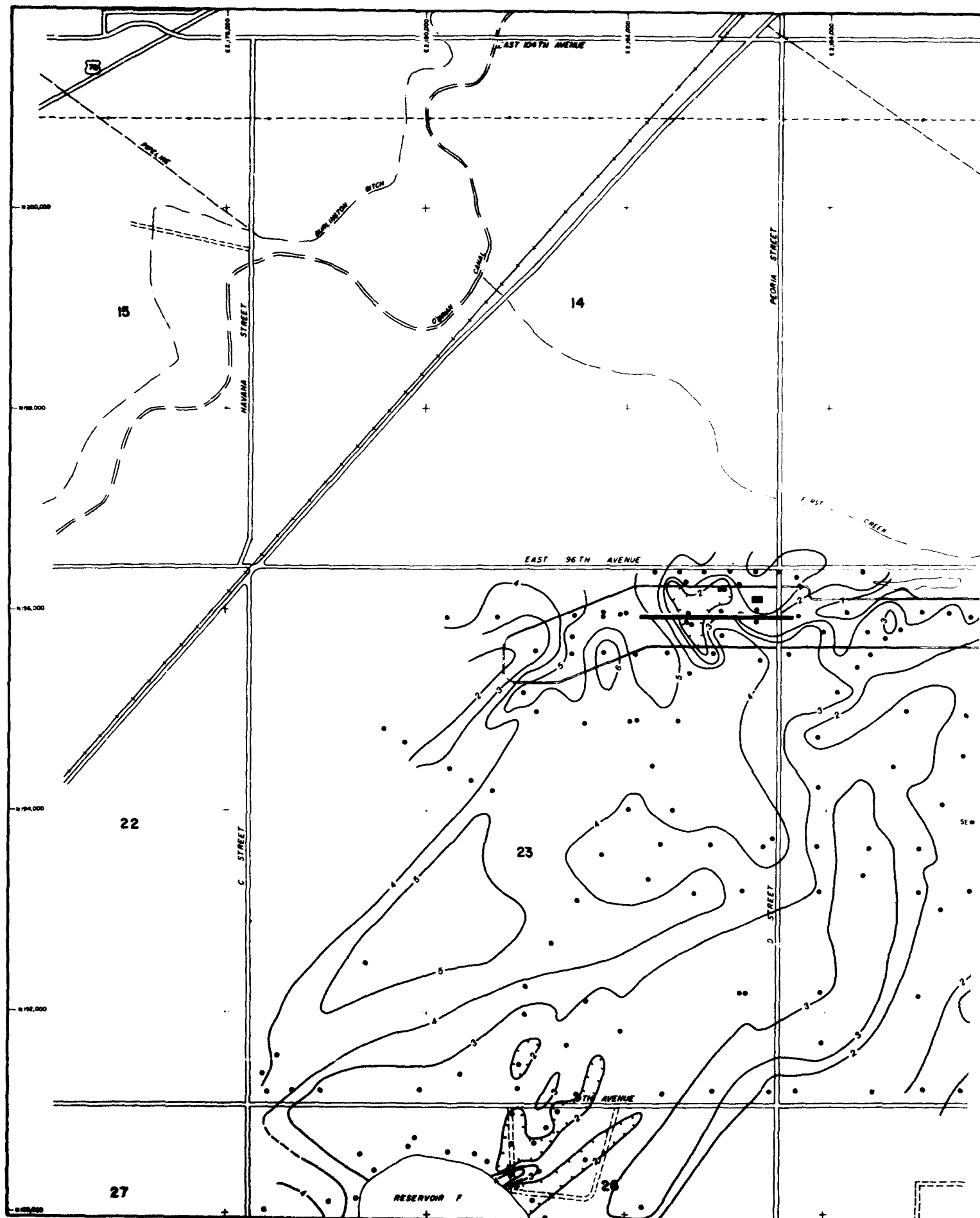


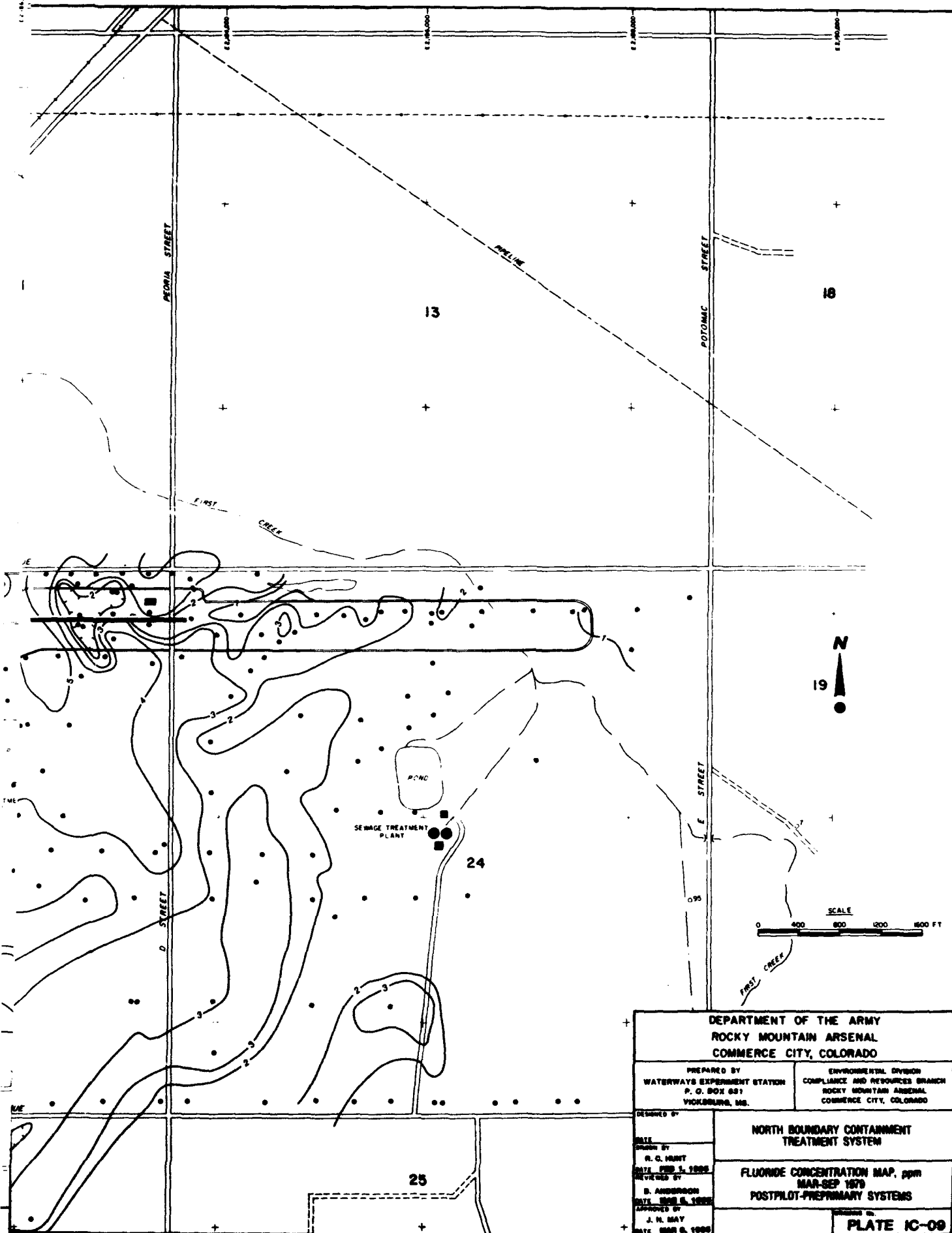


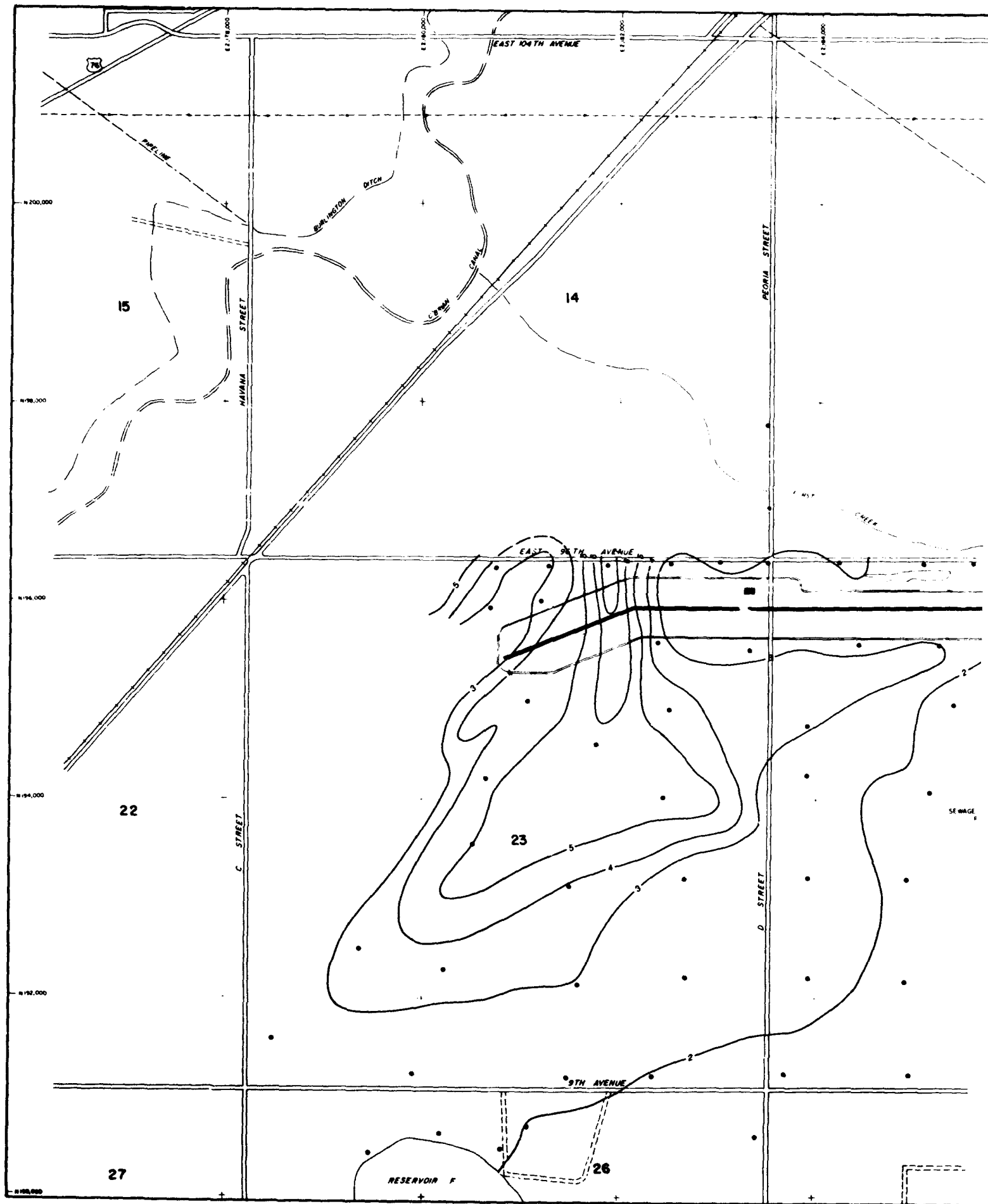


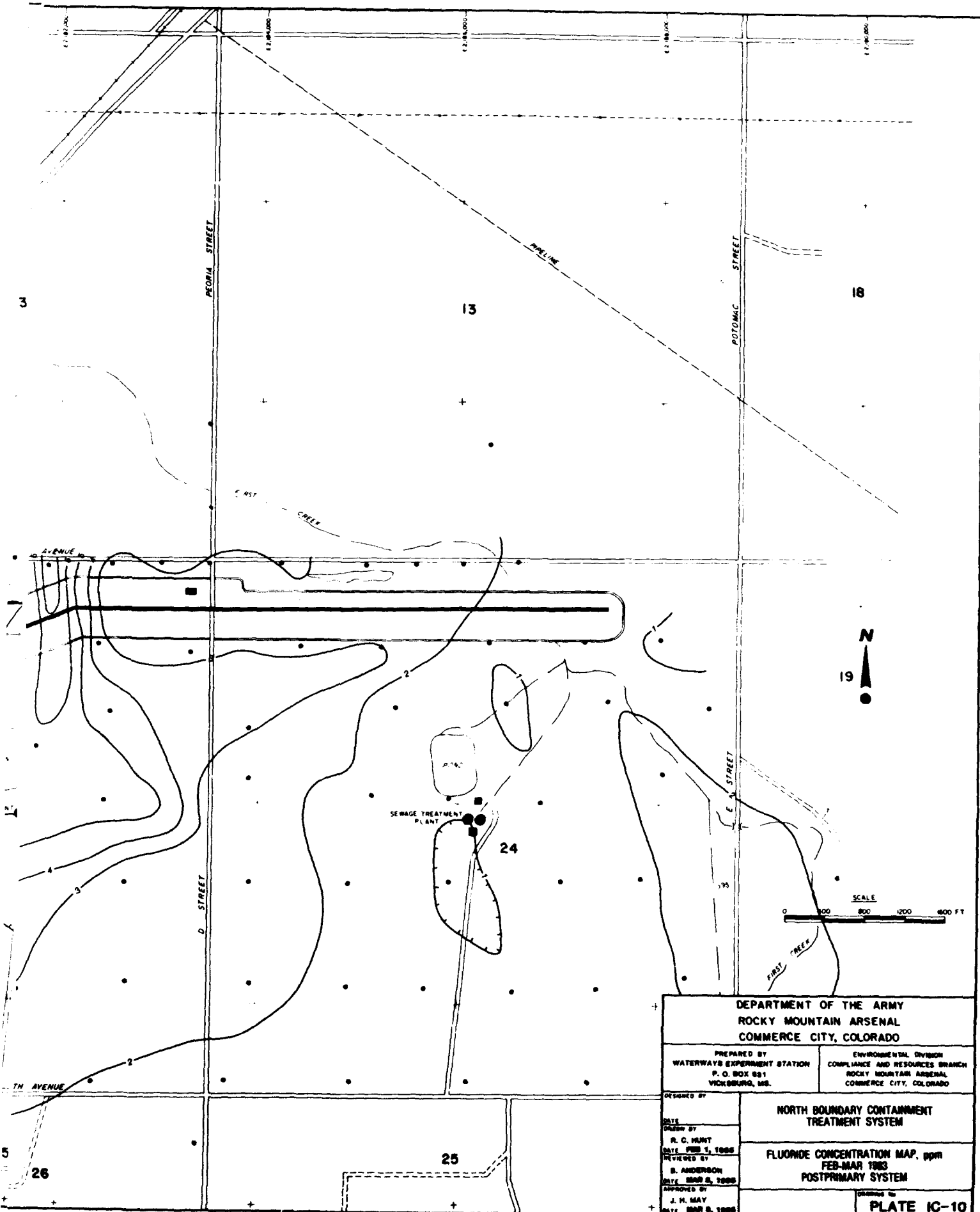


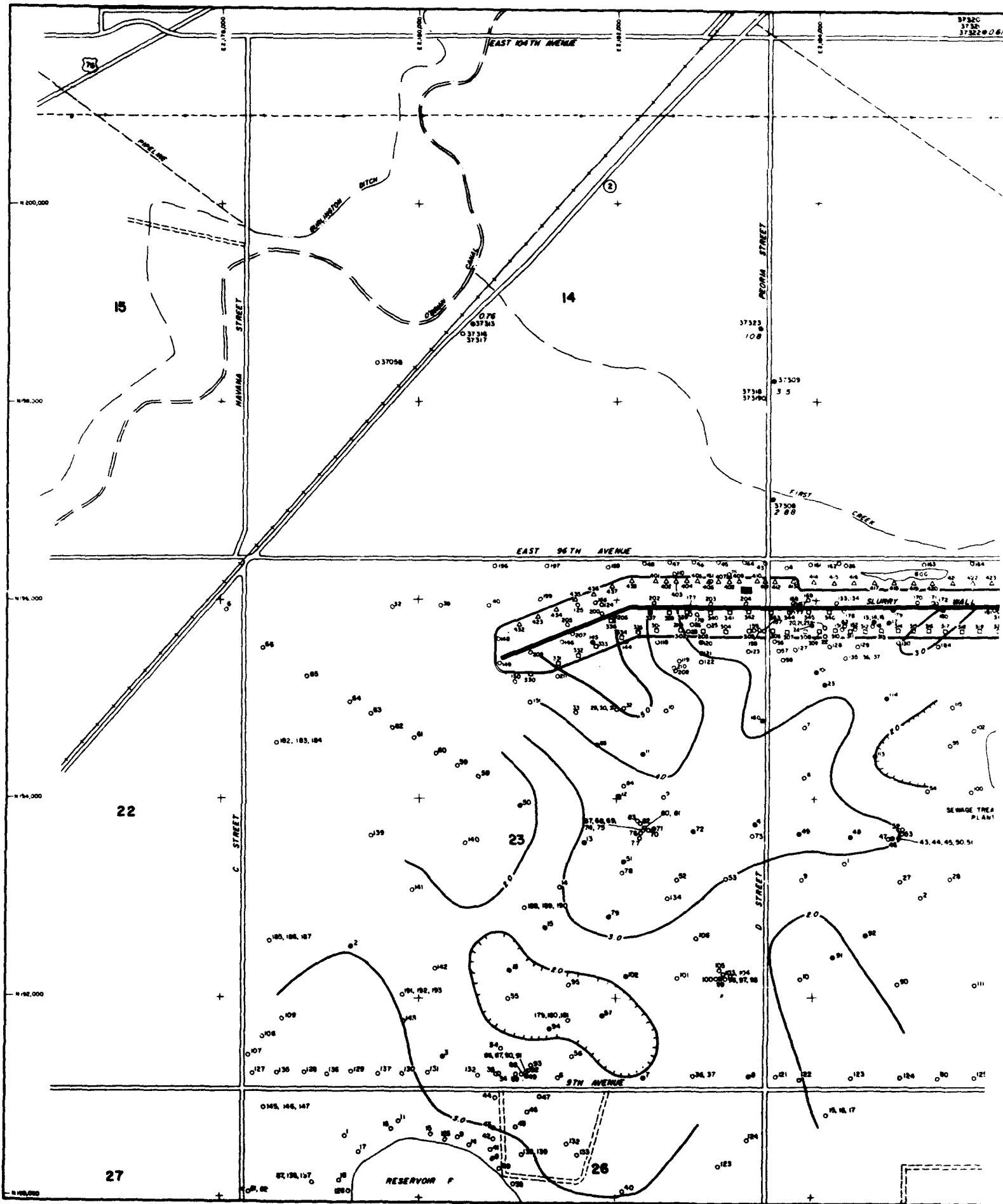


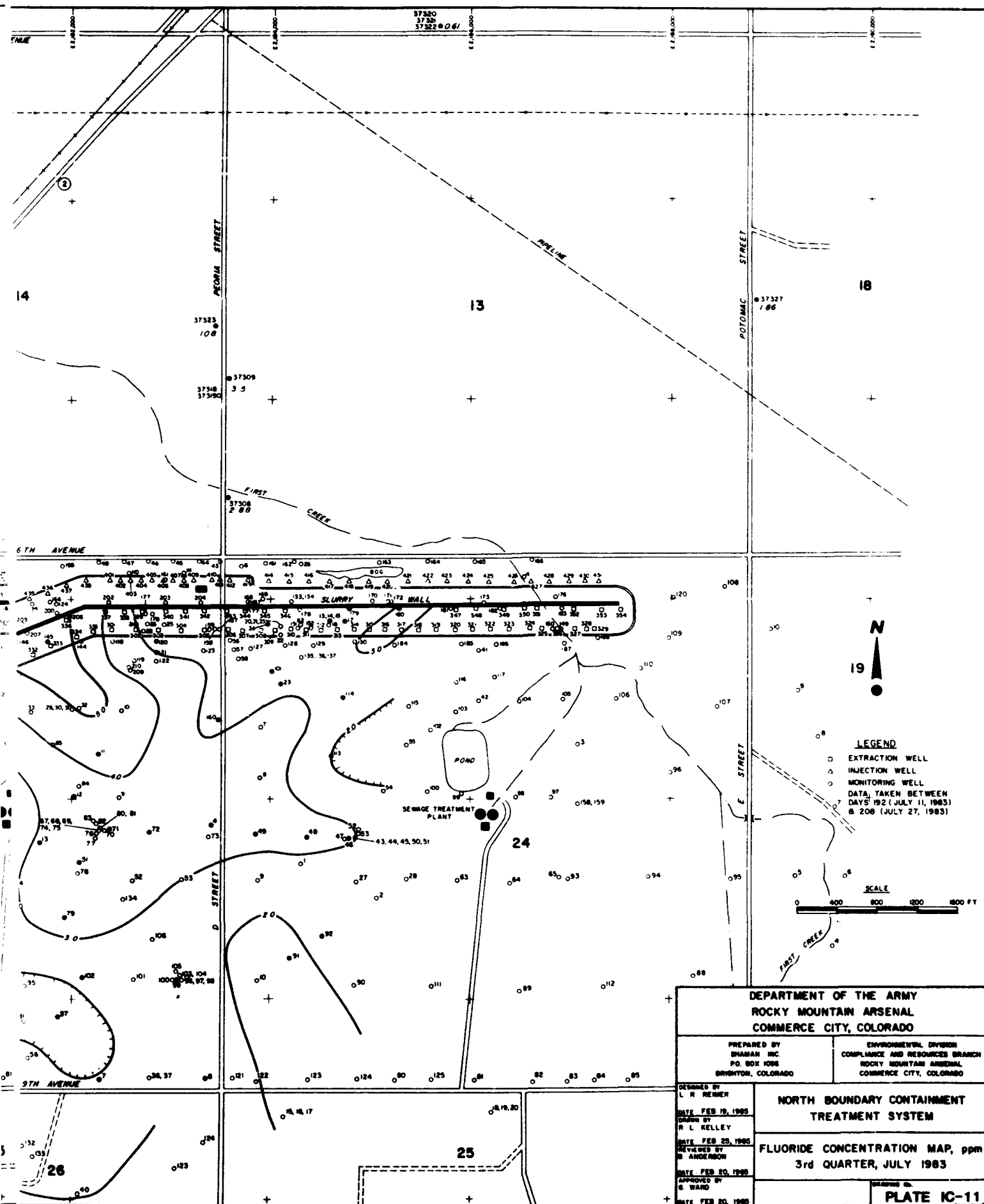


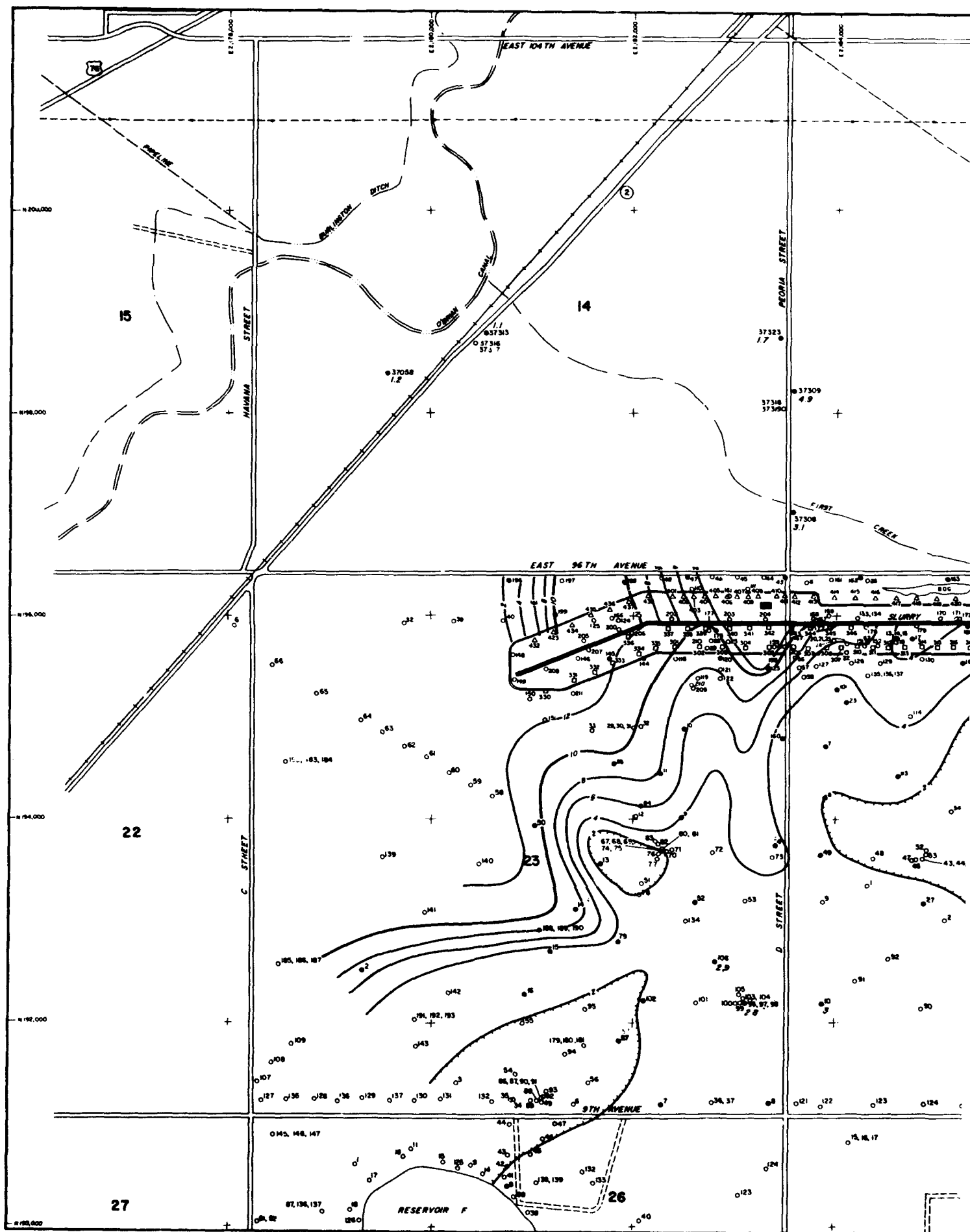


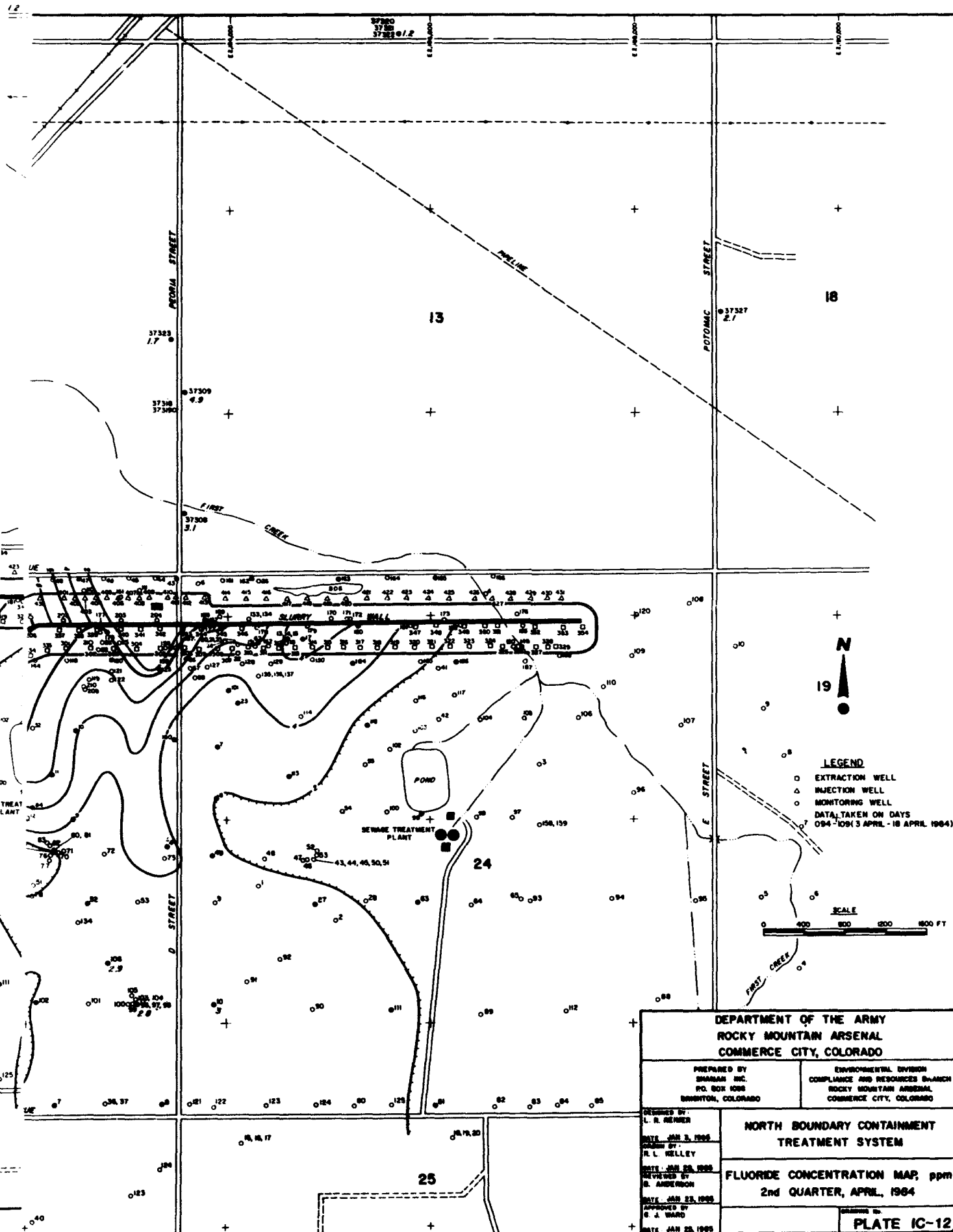












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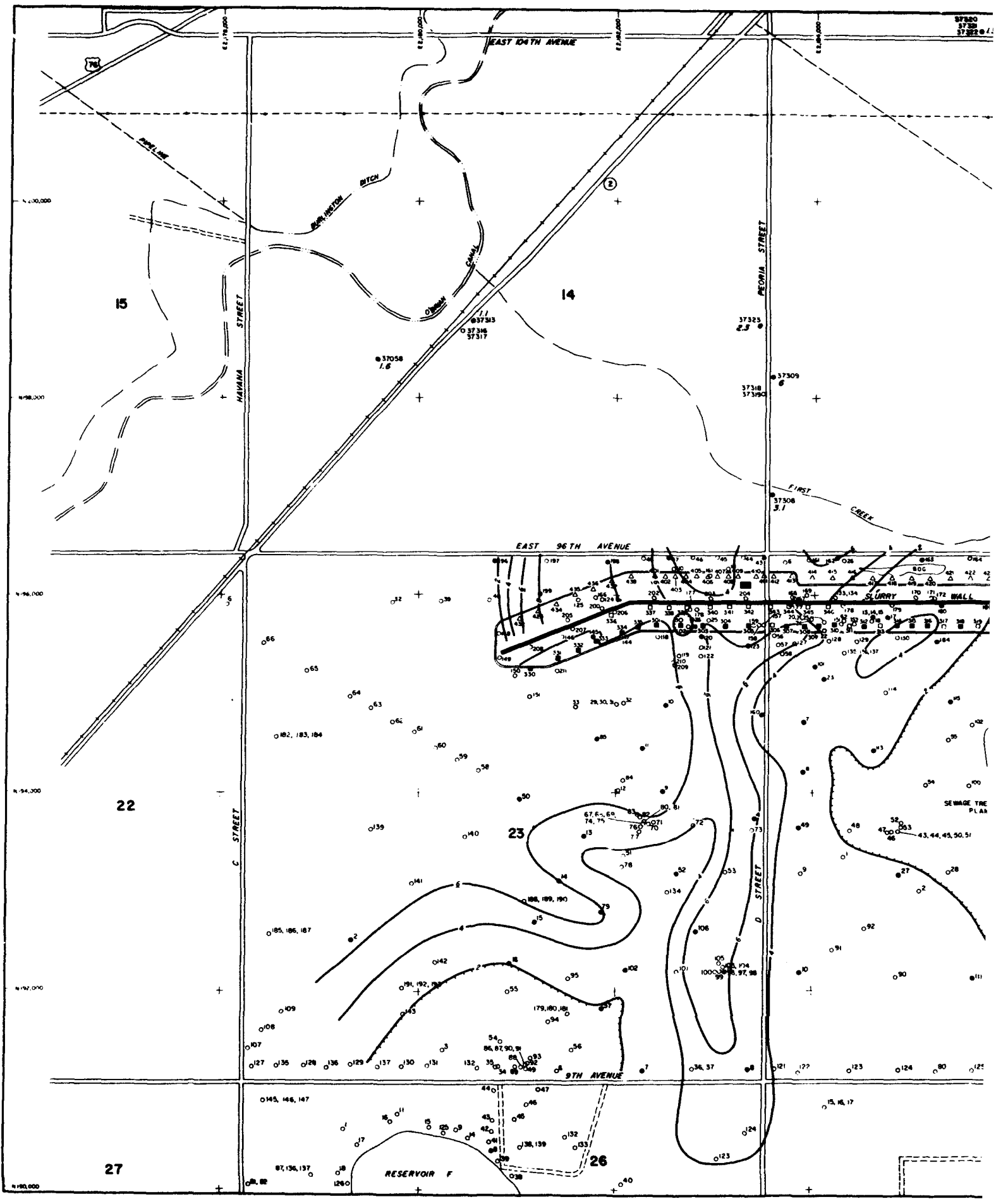
PREPARED BY
SHAWAN INC.
P.O. BOX 1088
BRINNON, COLORADO

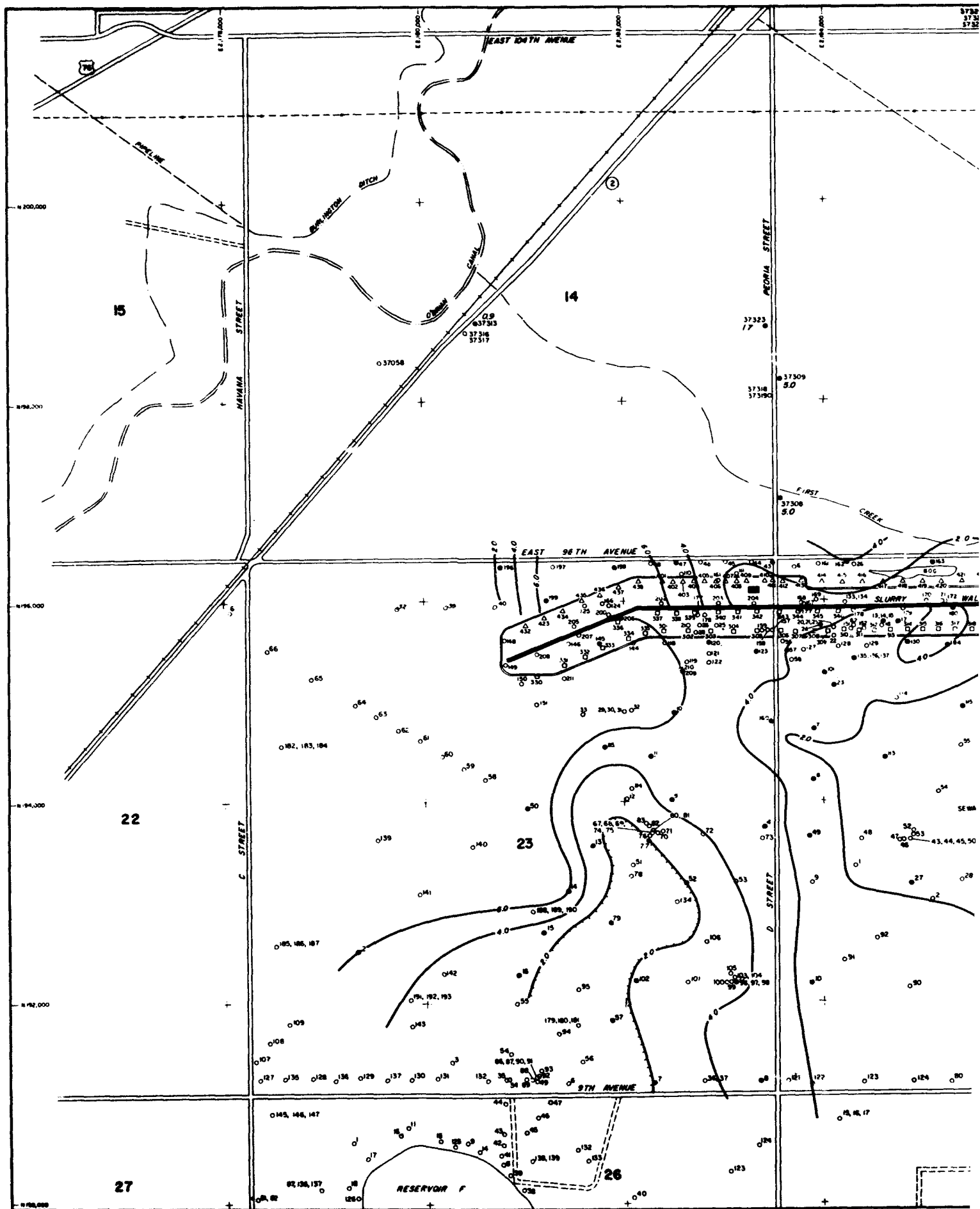
ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

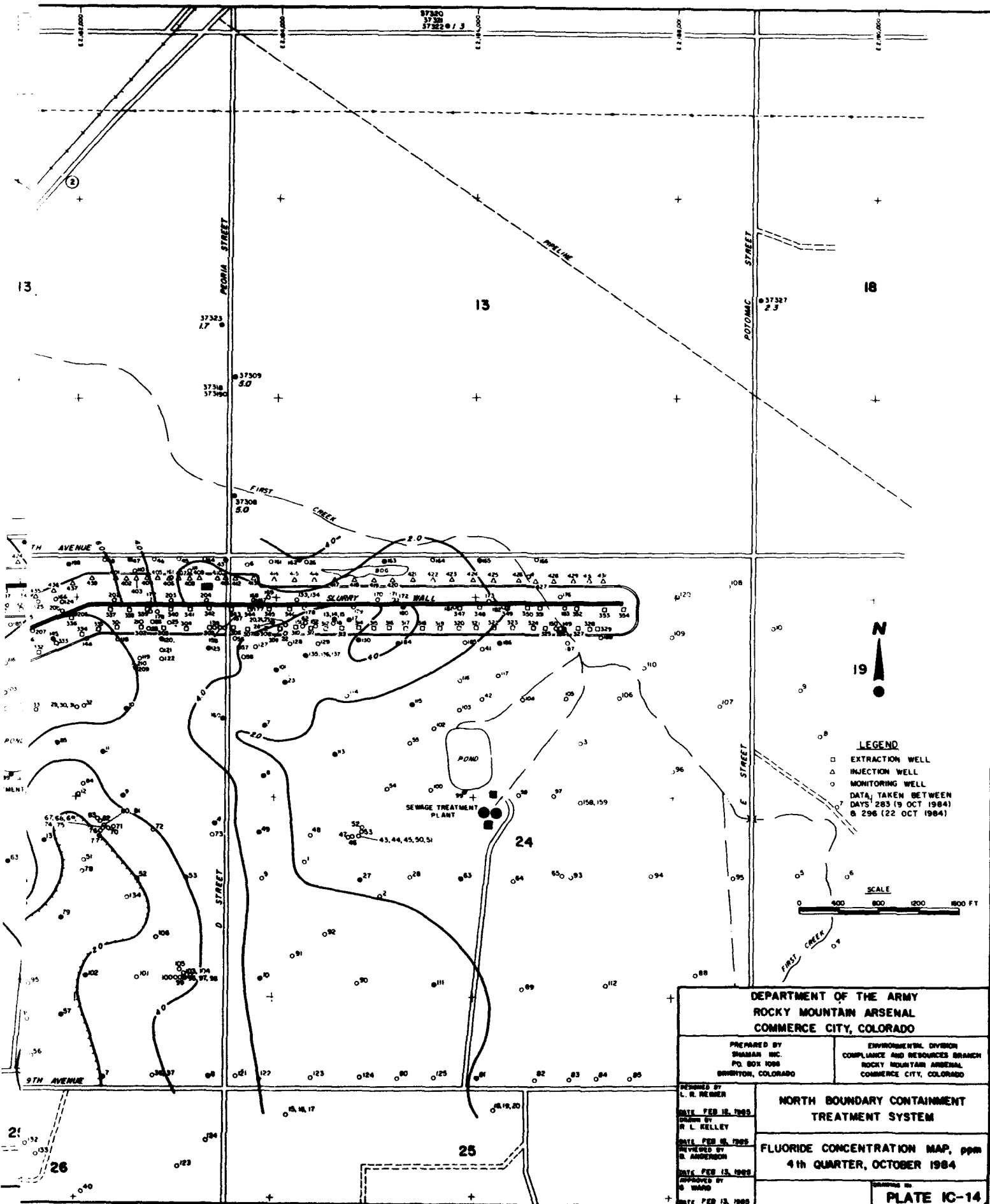
NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM

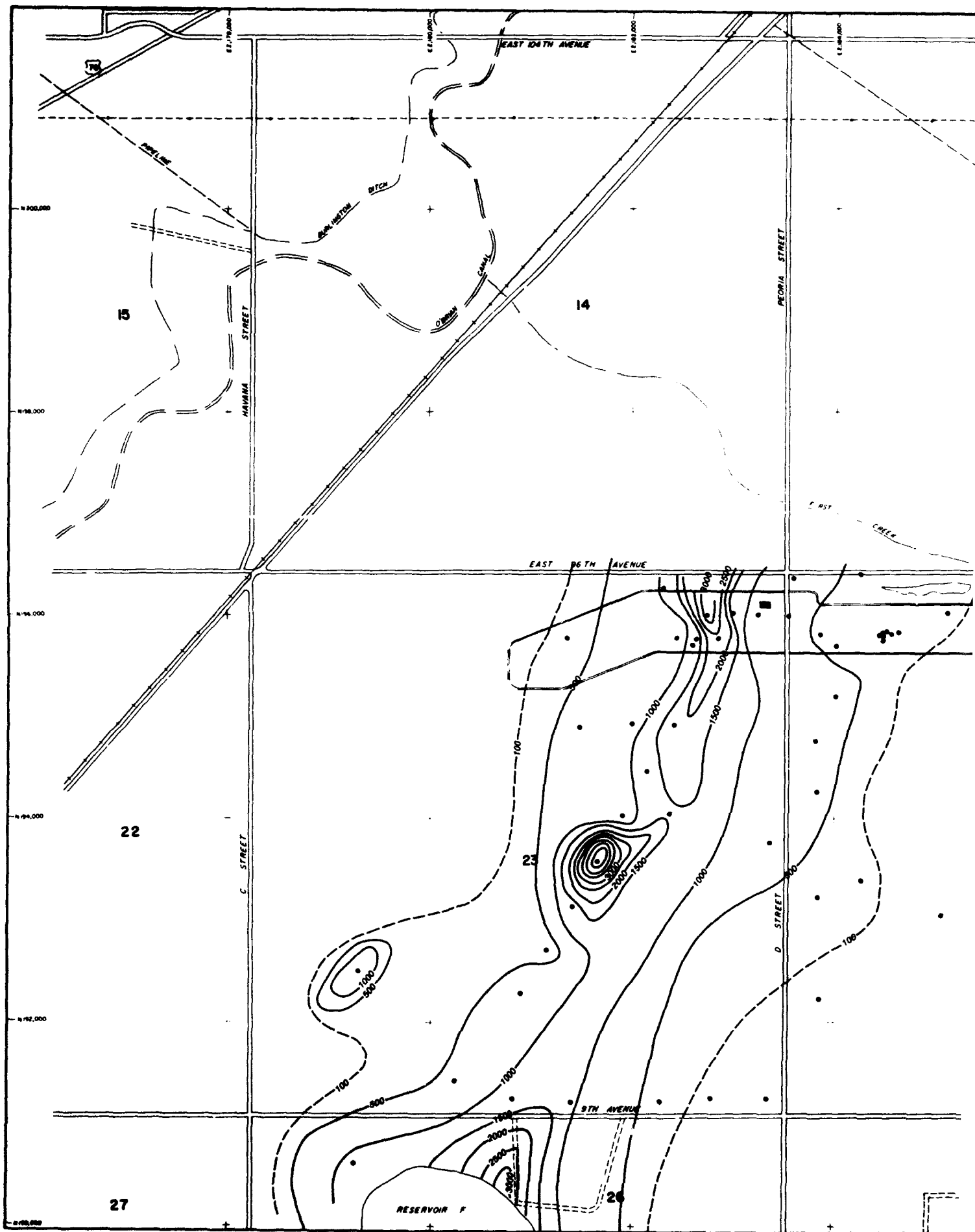
FLUORIDE CONCENTRATION MAP, ppm
2nd QUARTER, APRIL, 1984

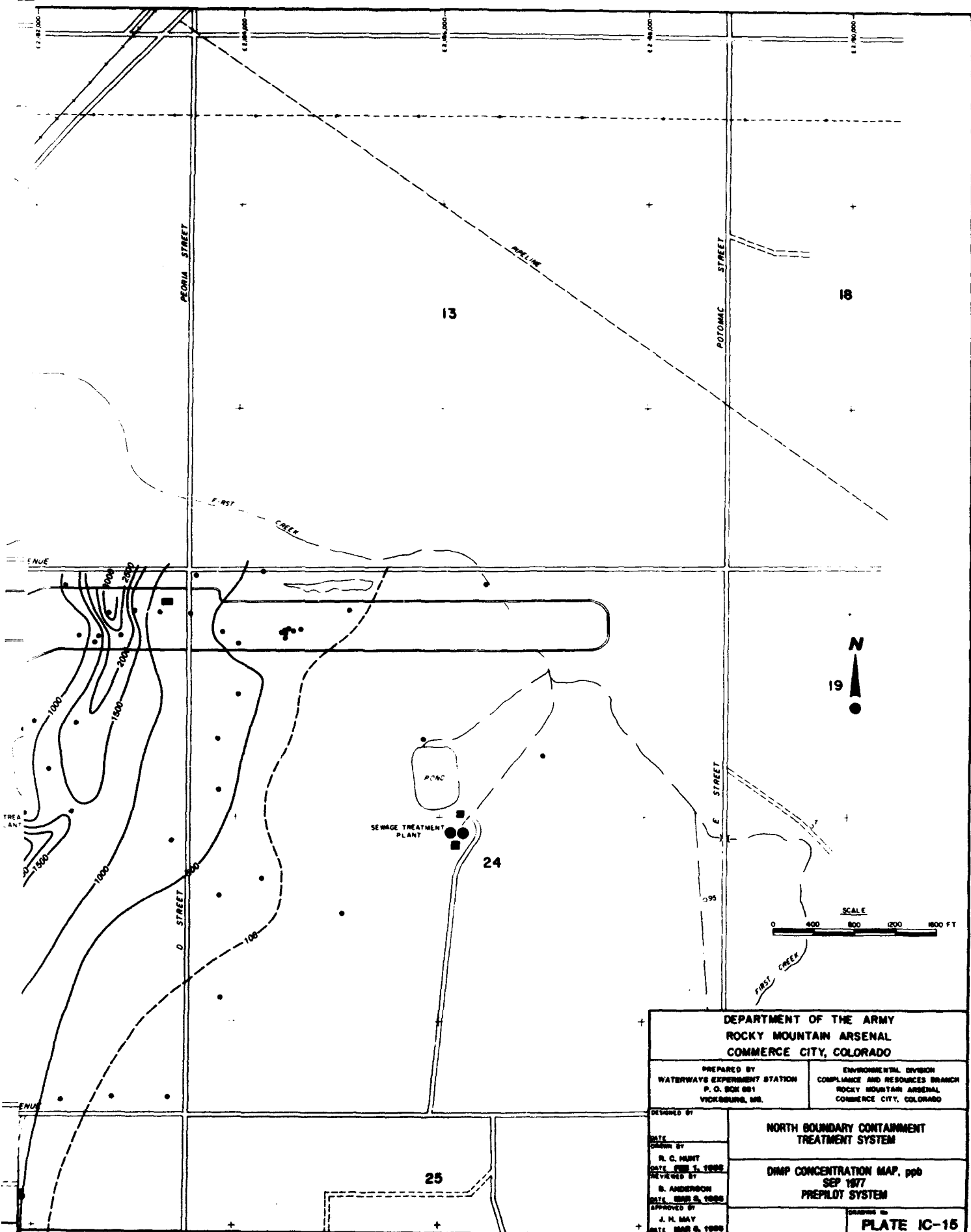
PLATE IC-12

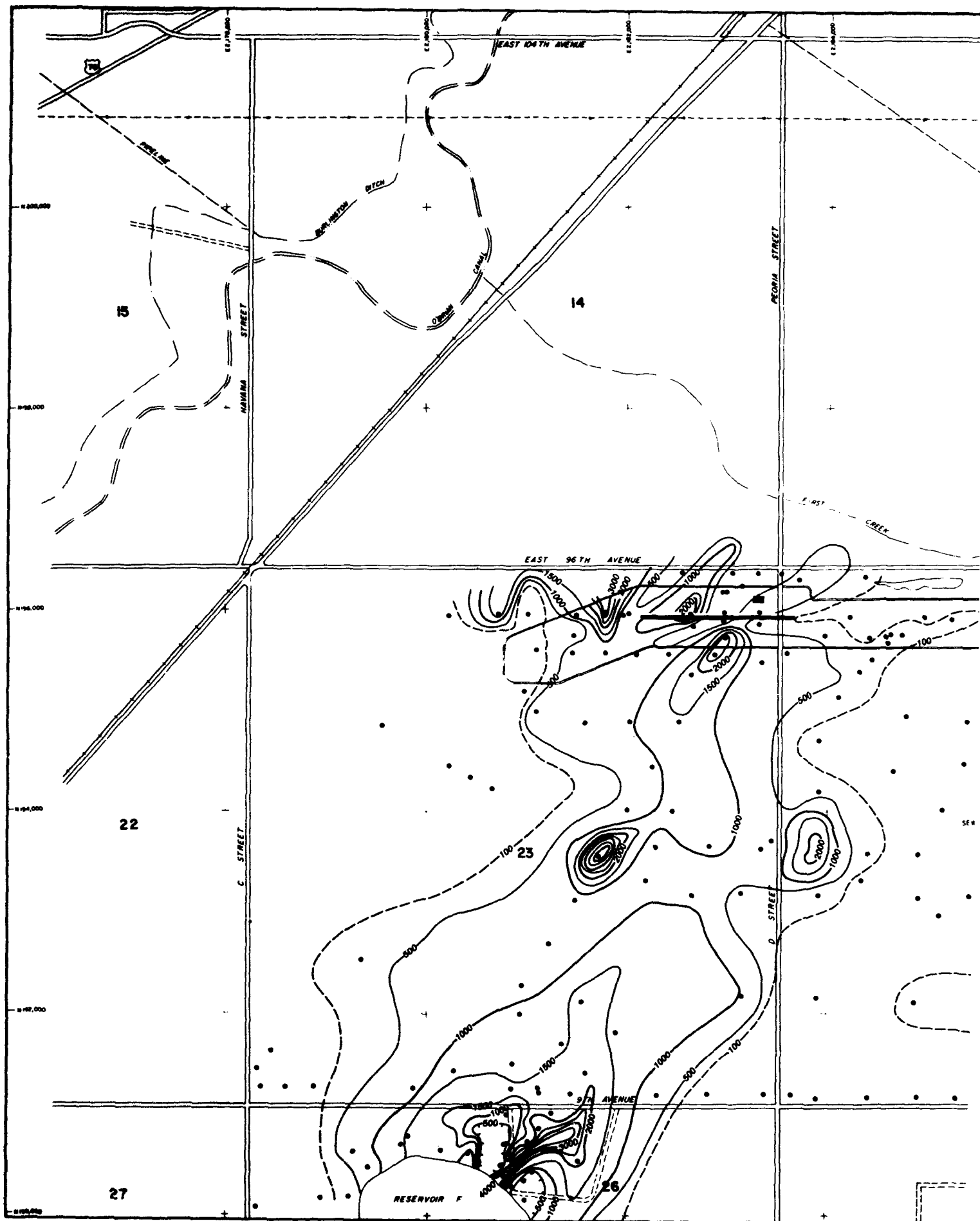


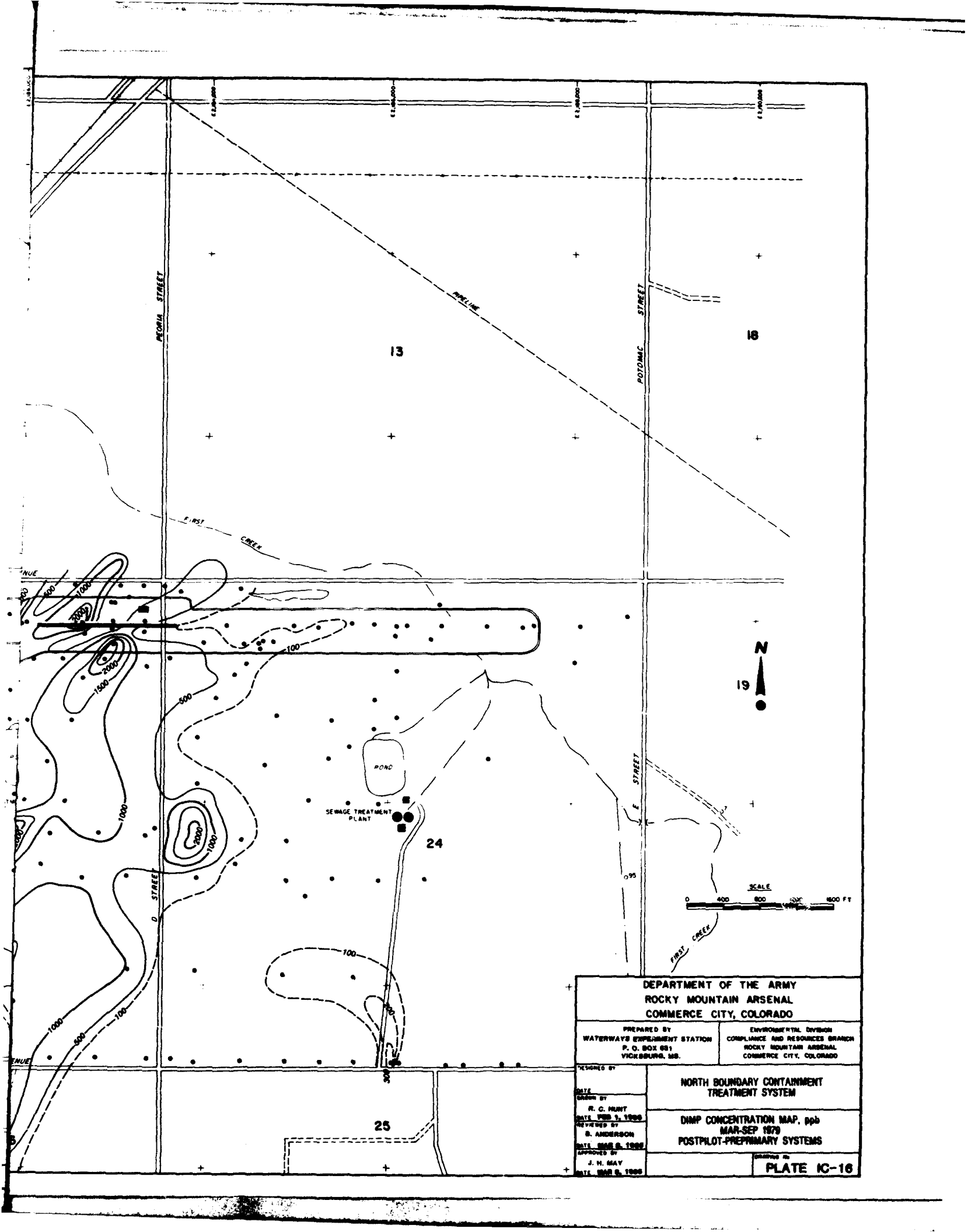












DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
WATERWAYS EXPERIMENT STATION
P. O. BOX 681
VICKSBURG, MS.

ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

DESIGNED BY

DATE

DRAWN BY

R. C. MUNT

DATE FEB 3, 1988

REVIEWED BY

S. ANDERSON

DATE MAR 8, 1988

APPROVED BY

J. H. MAY

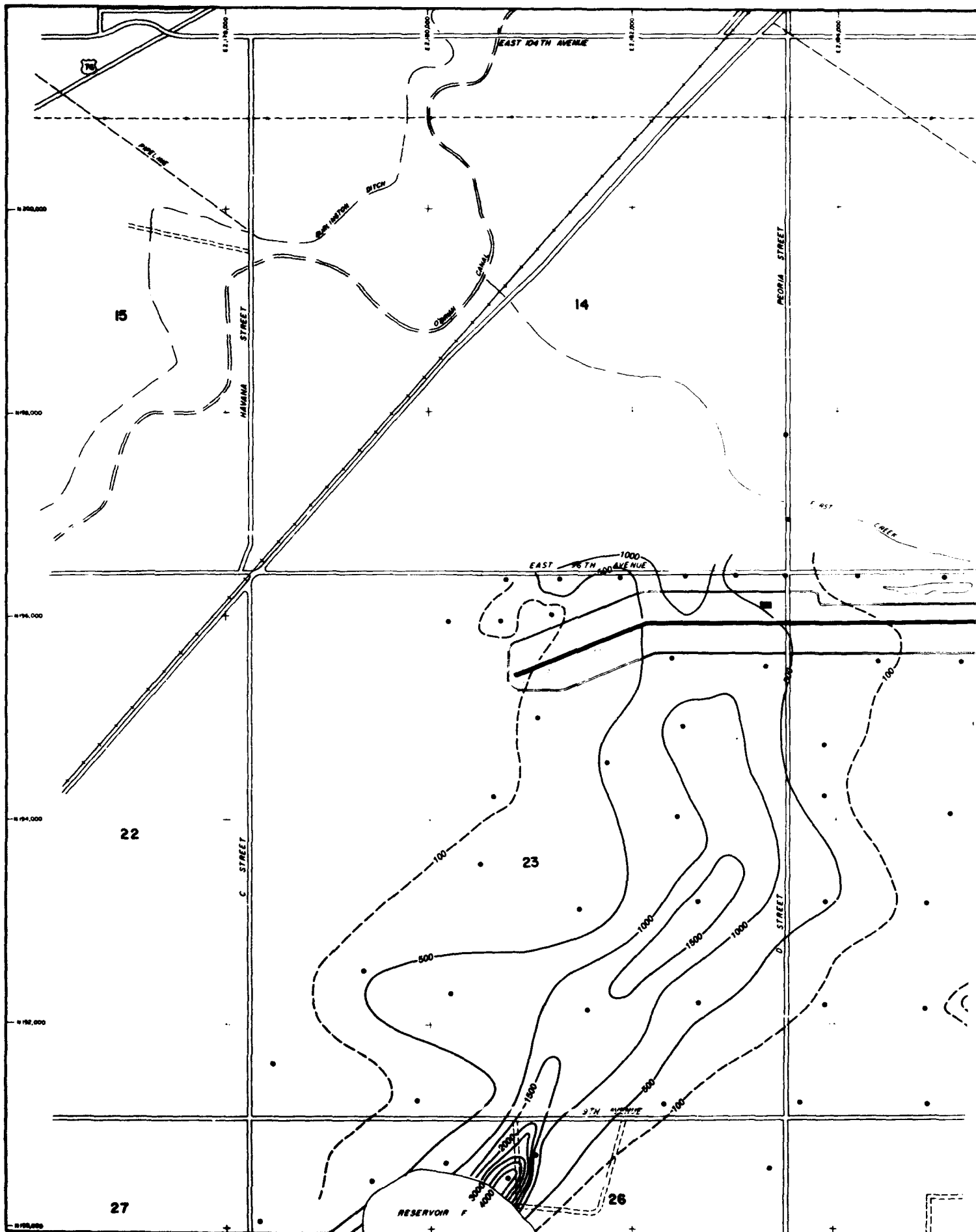
DATE MAR 8, 1988

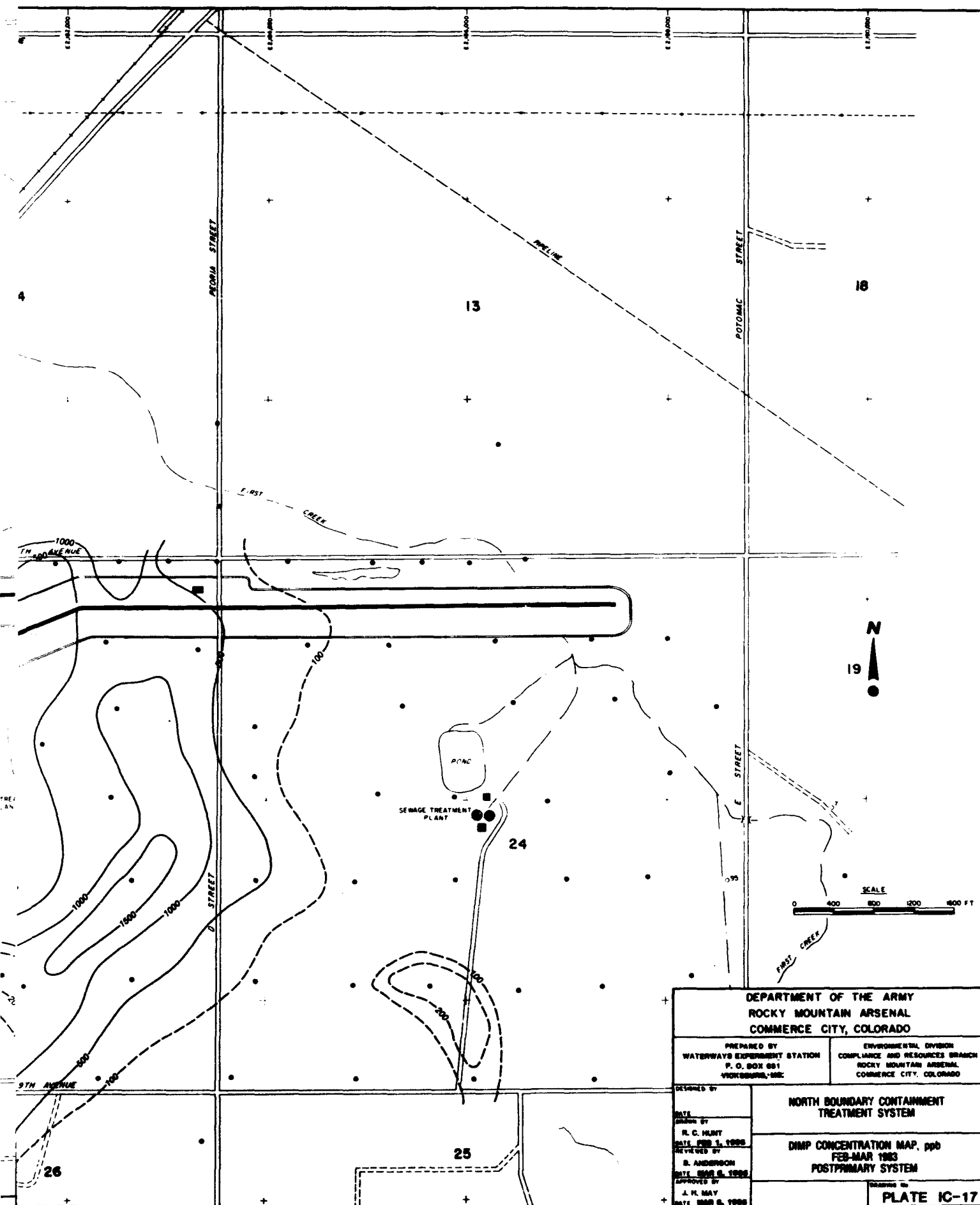
NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM

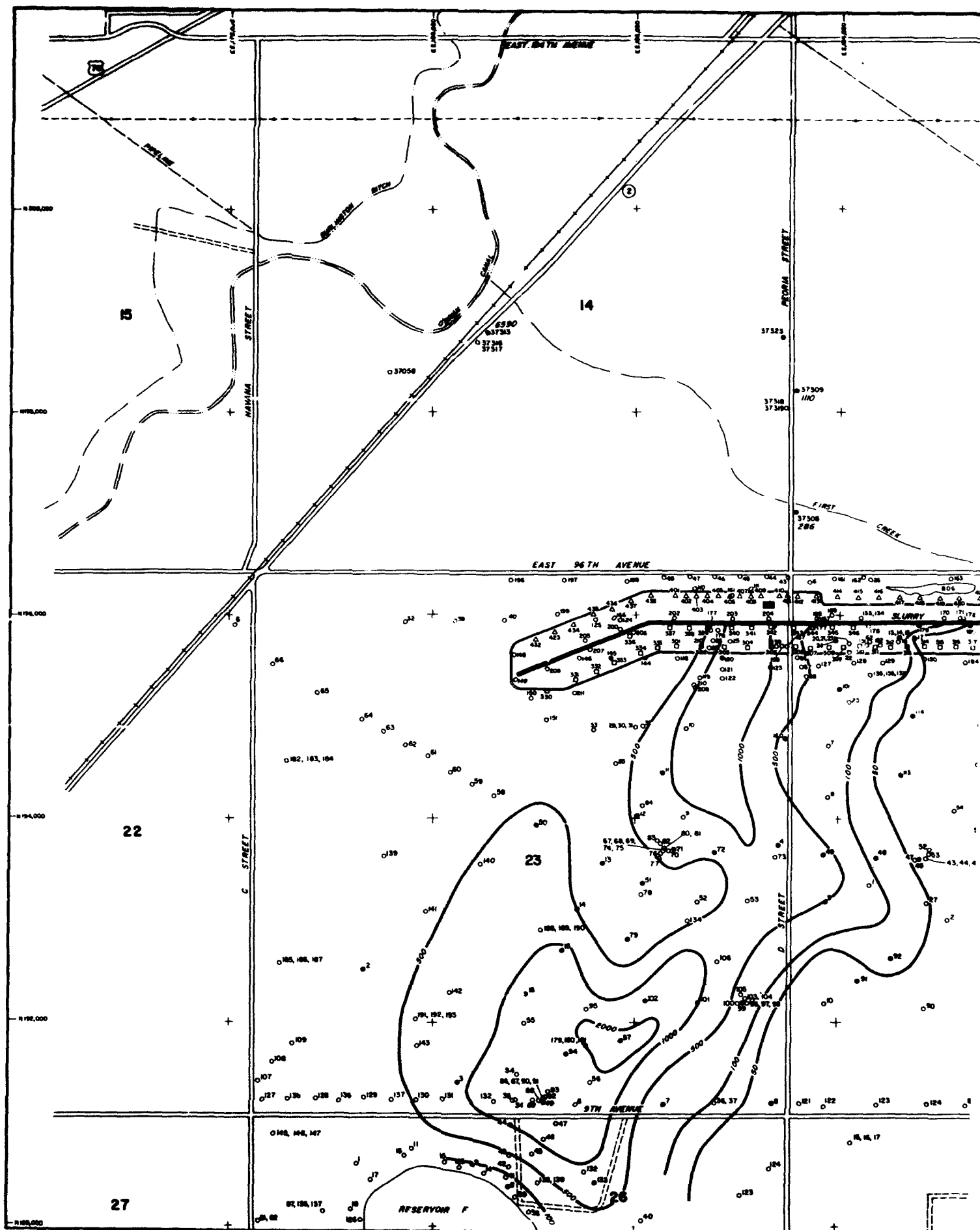
DIMP CONCENTRATION MAP, ppb
MAR-SEP 1979
POSTPILOT-PREPRIMARY SYSTEMS

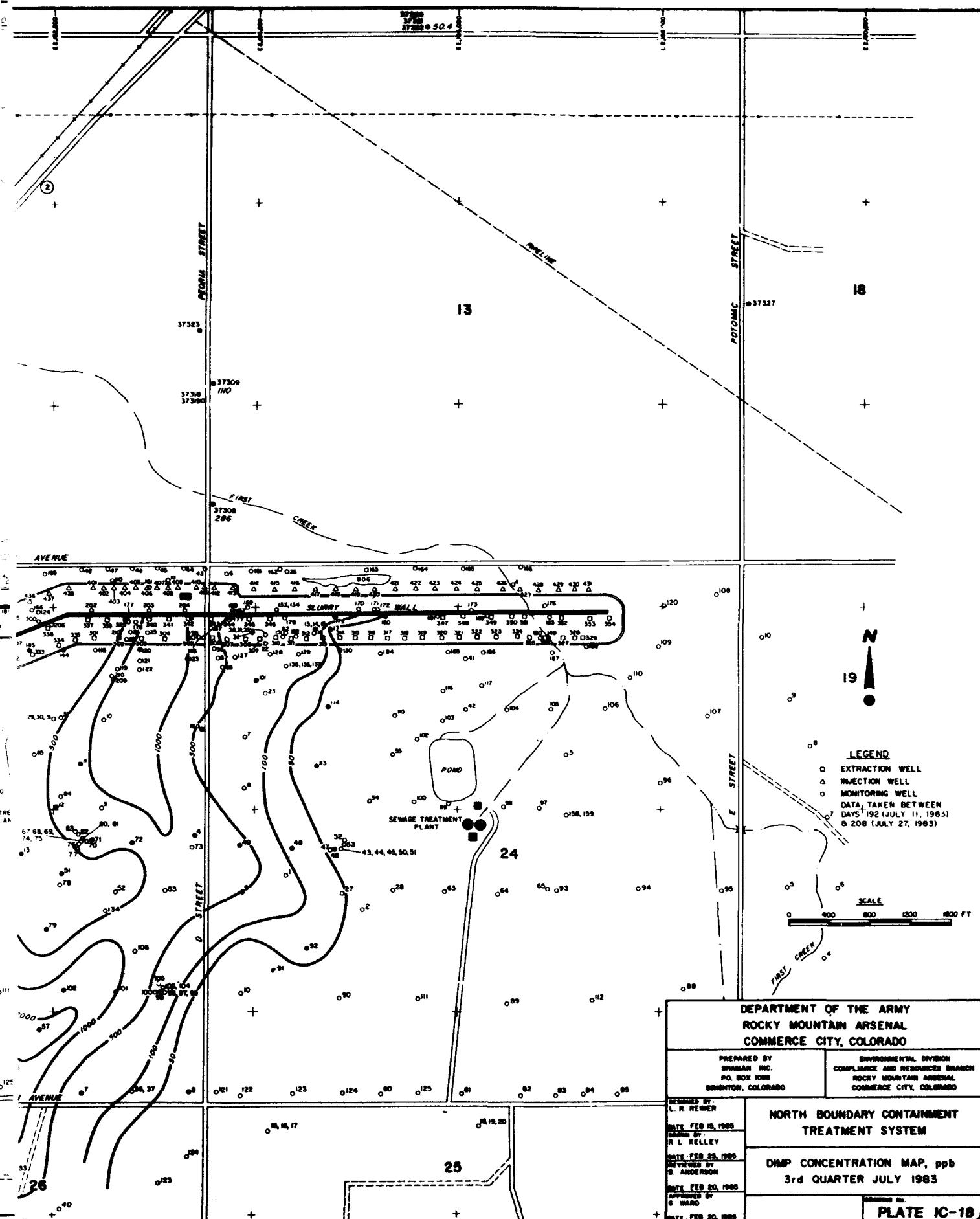
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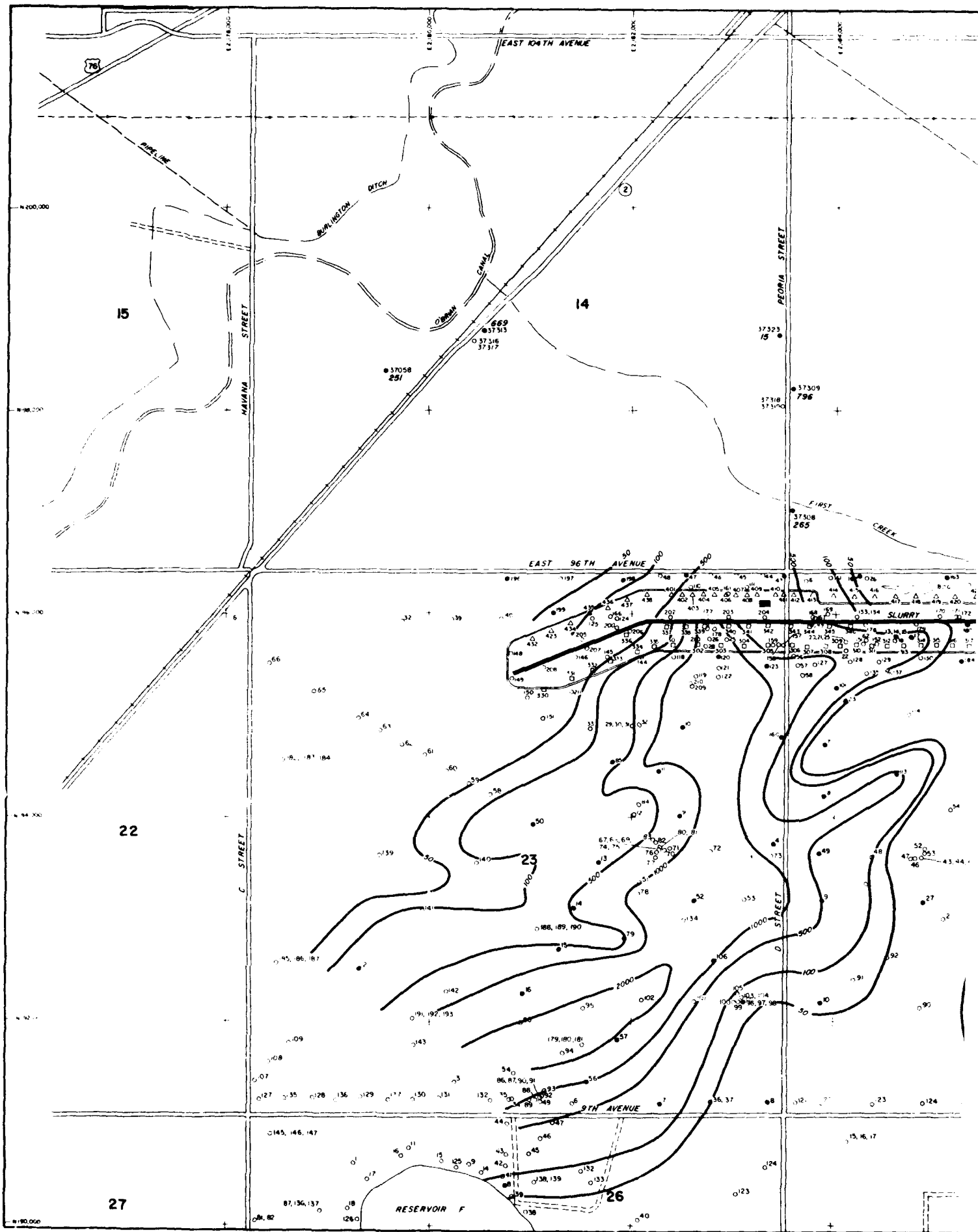
PLATE IC-16

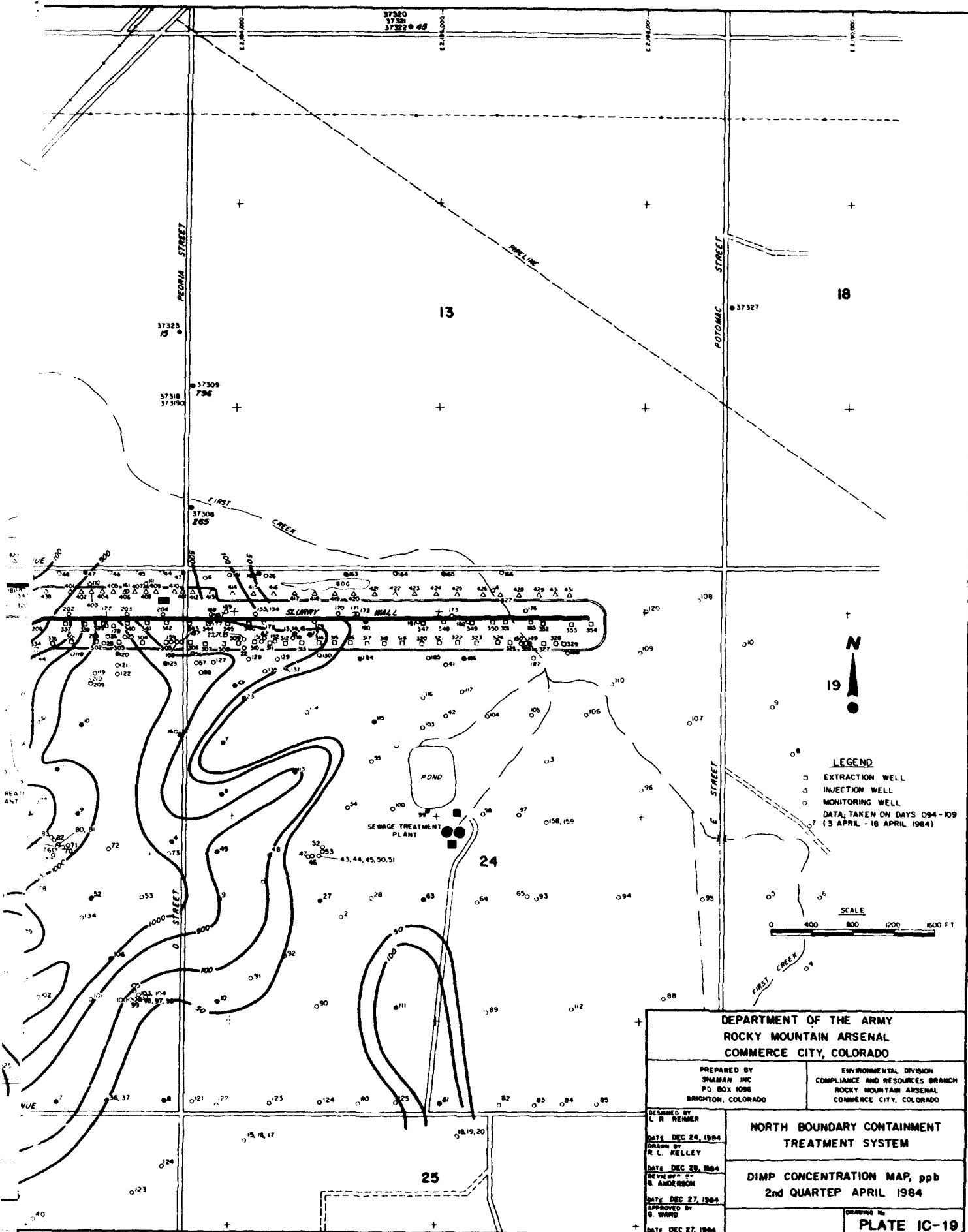


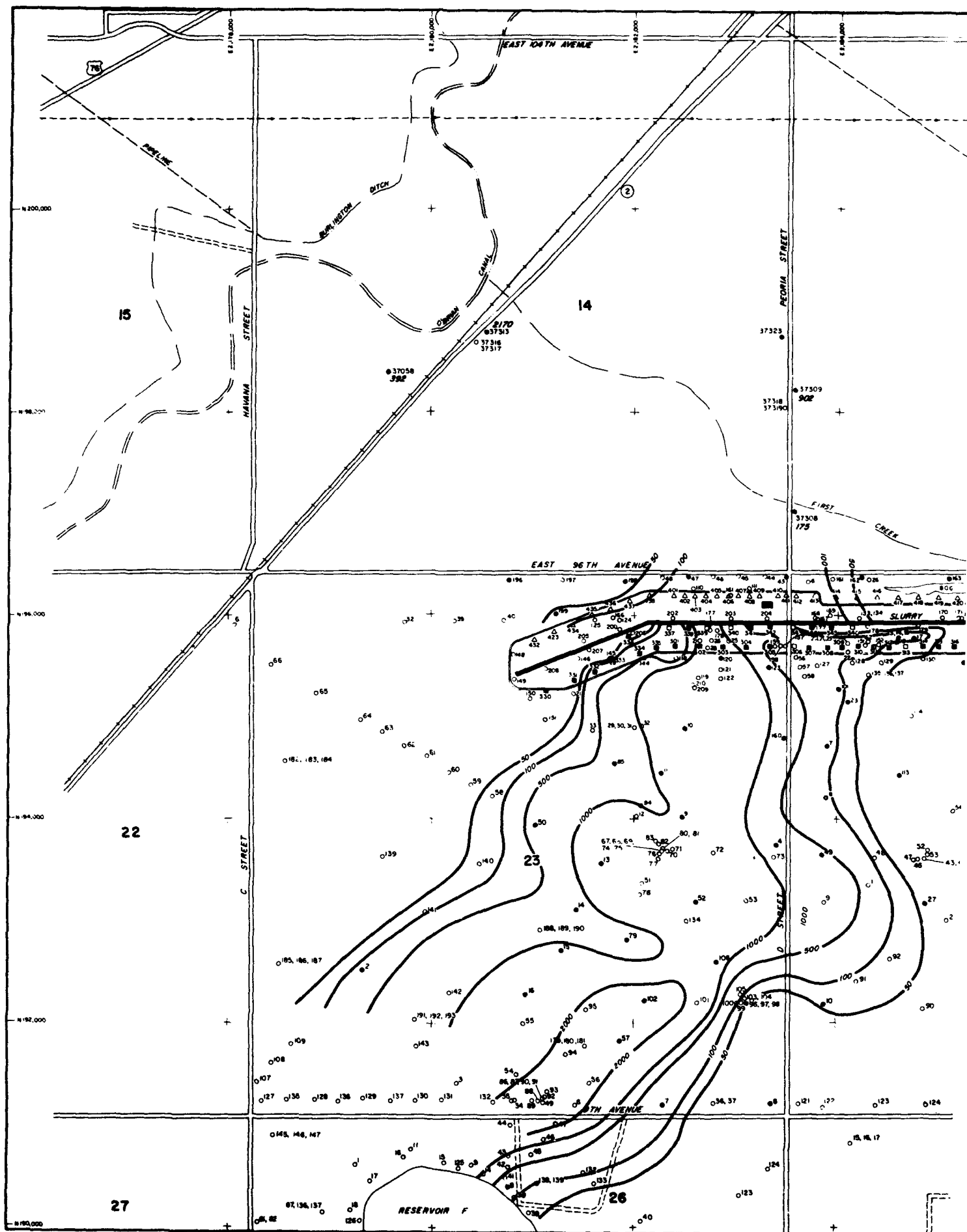


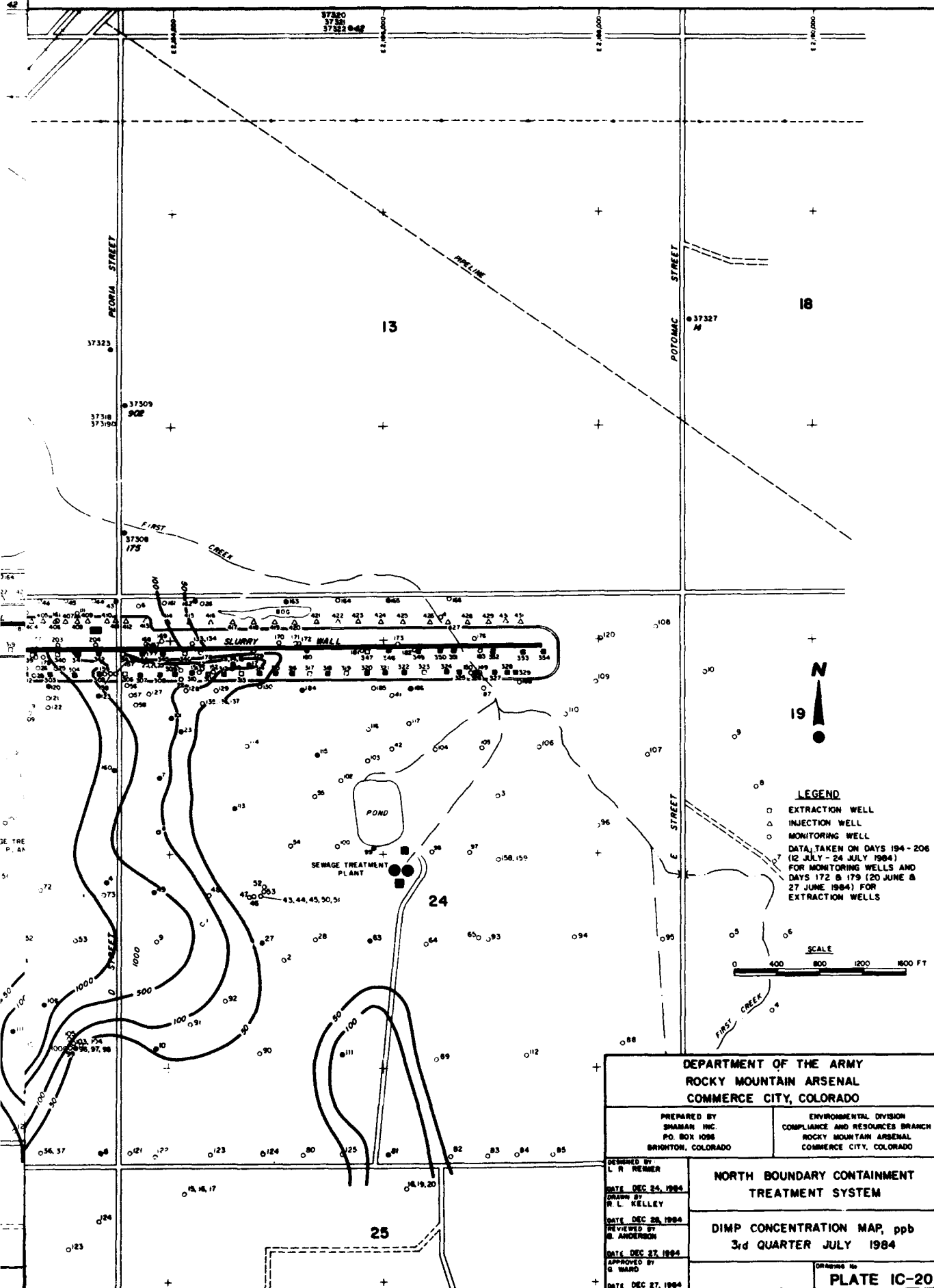












DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
SHAMAN INC.
P.O. BOX 1086
BRIGHTON, COLORADO

ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

DESIGNED BY
L. R. REIMER
DATE DEC 24, 1984
DRAWN BY
R. L. KELLEY

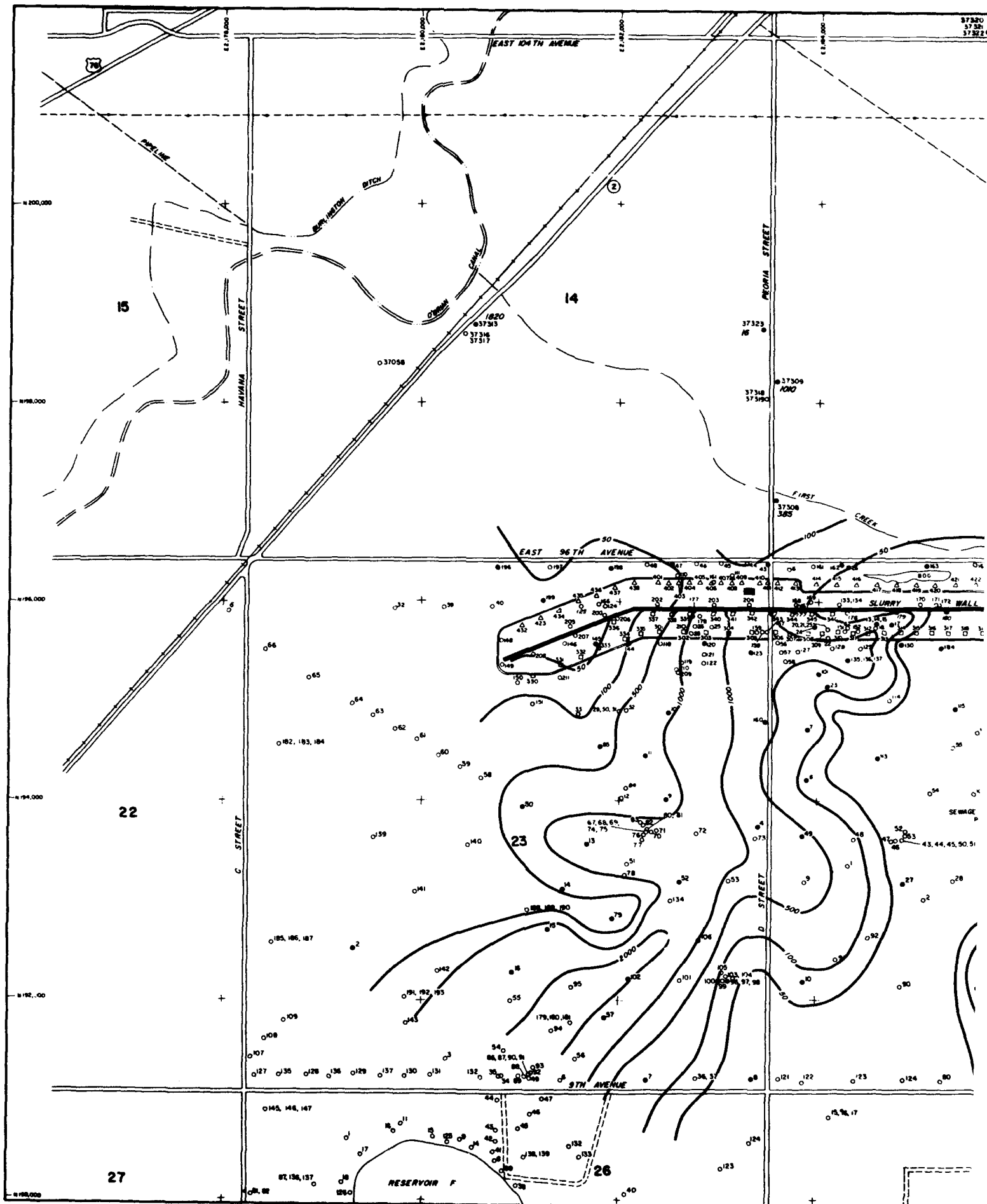
DATE DEC 26, 1984
REVIEWED BY
R. ANDERSON

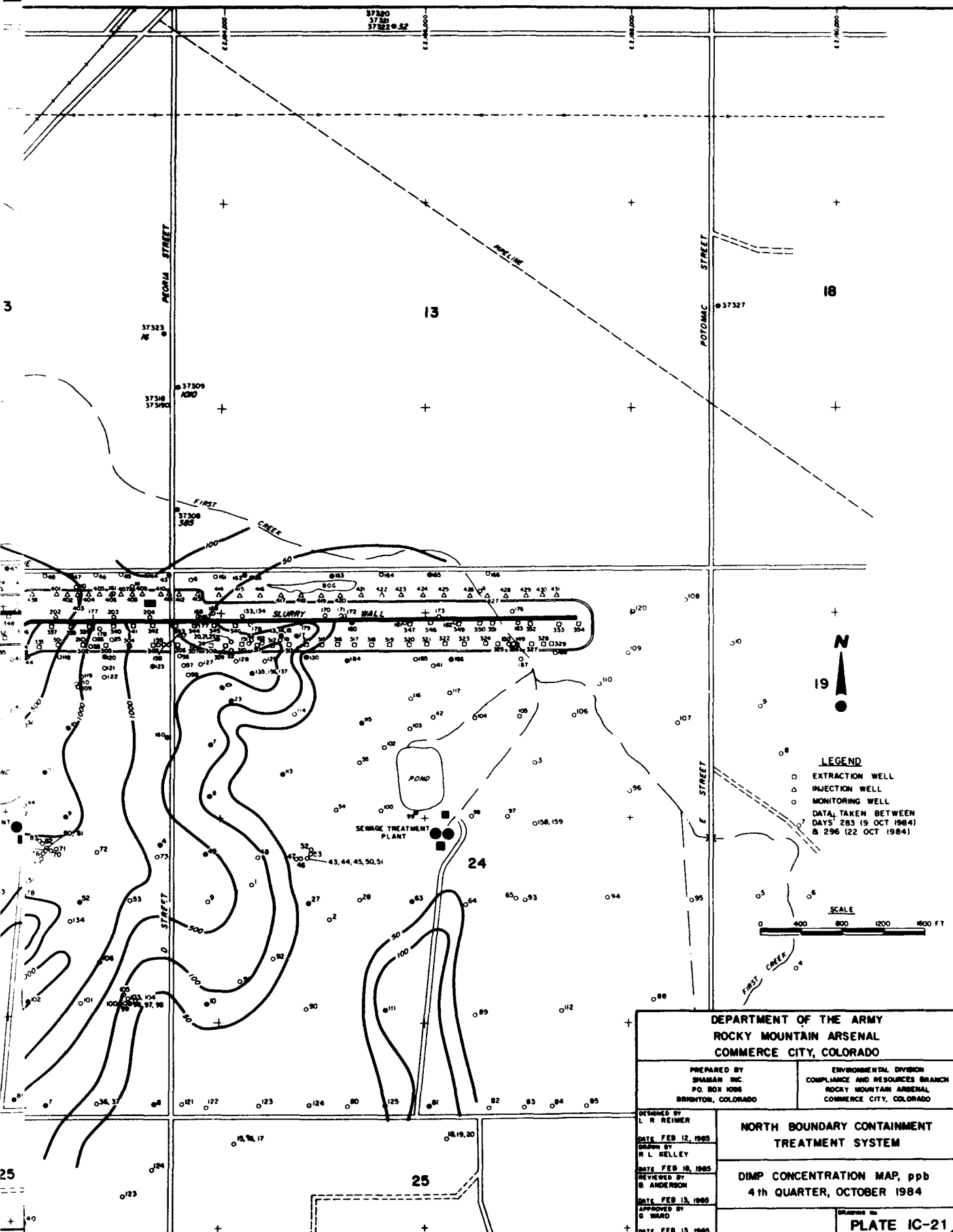
DATE DEC 27, 1984
APPROVED BY
G. WARD
DATE DEC 27, 1984

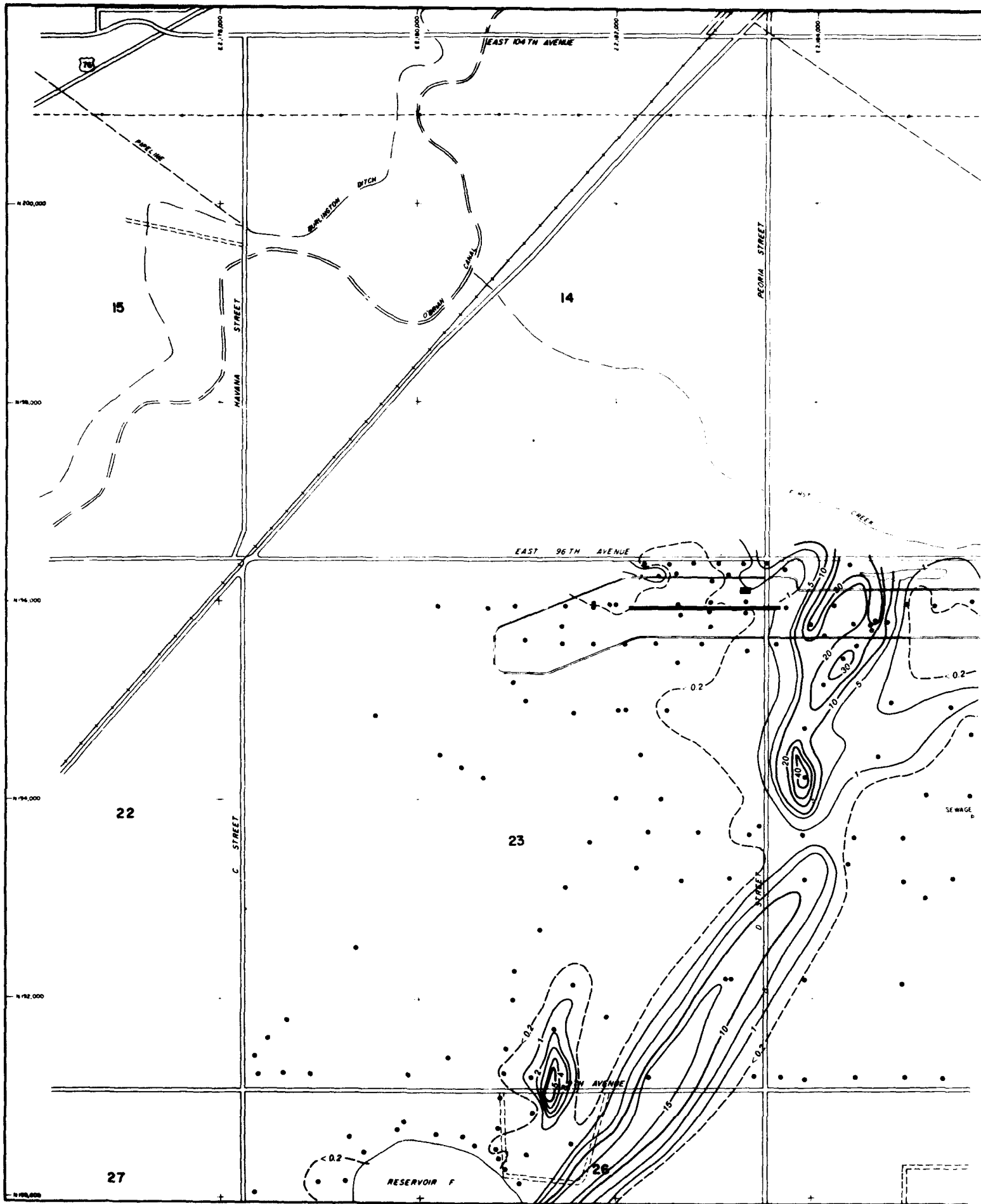
NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM

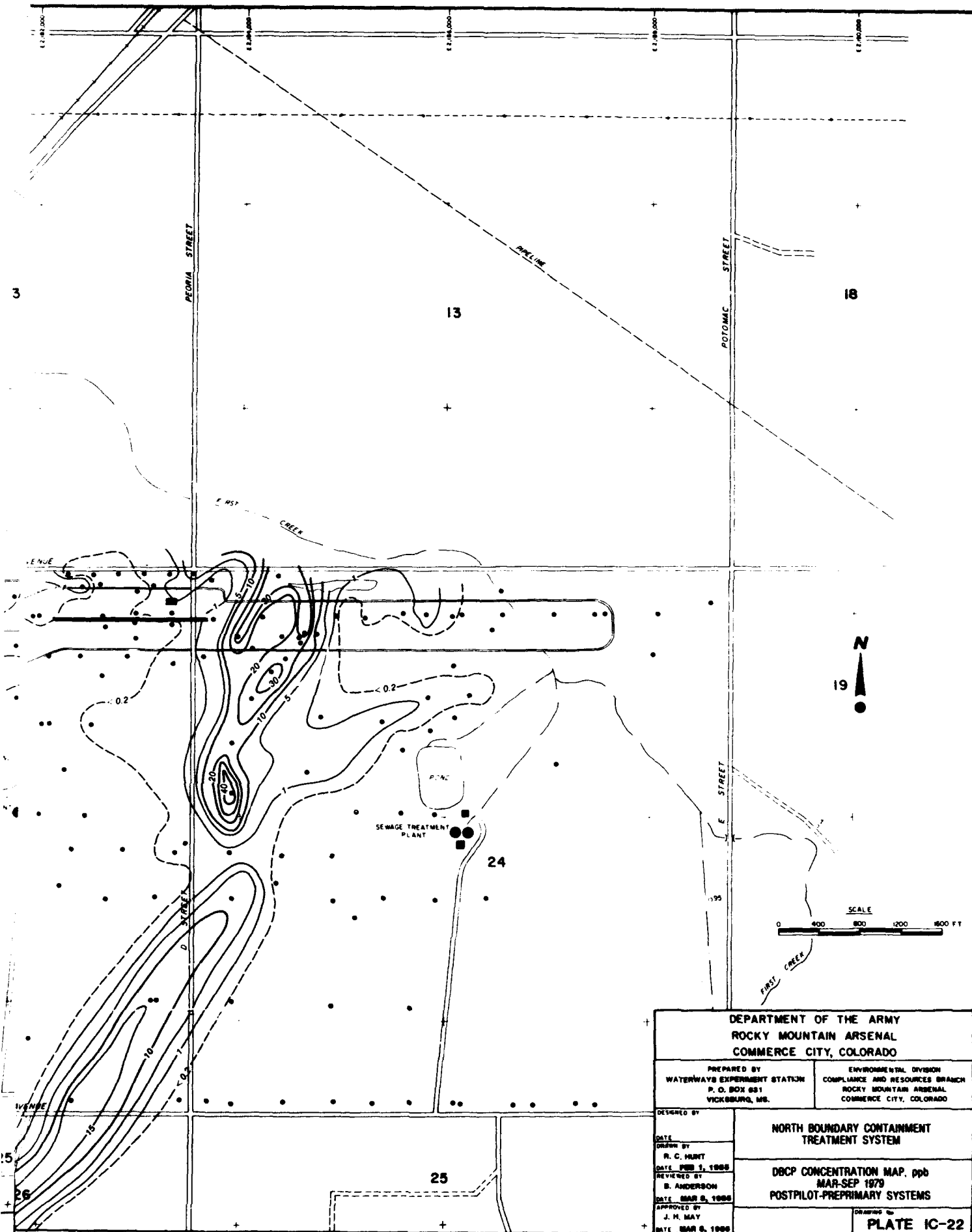
DIMP CONCENTRATION MAP, ppb
3rd QUARTER JULY 1984

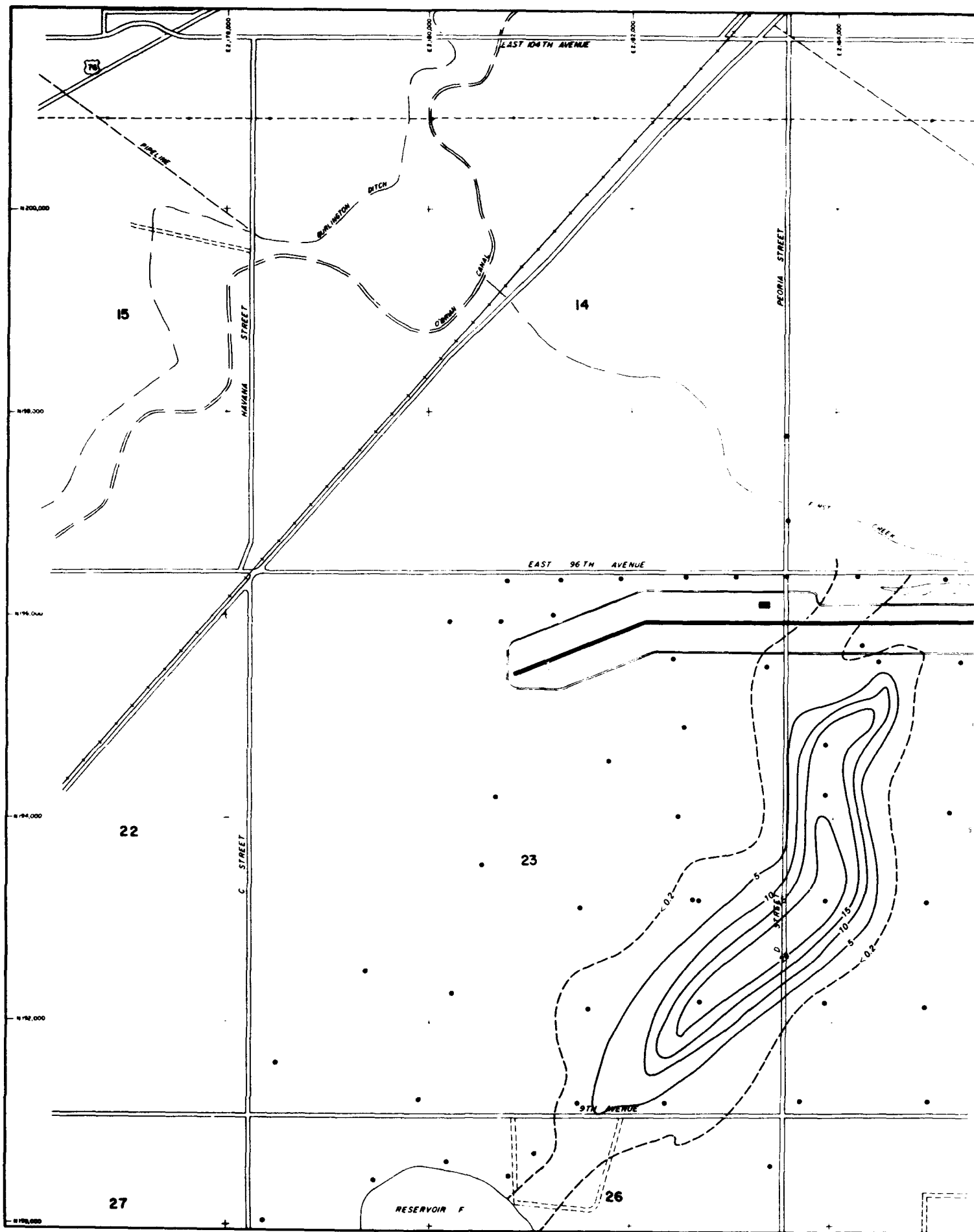
Drawing No.
PLATE IC-20

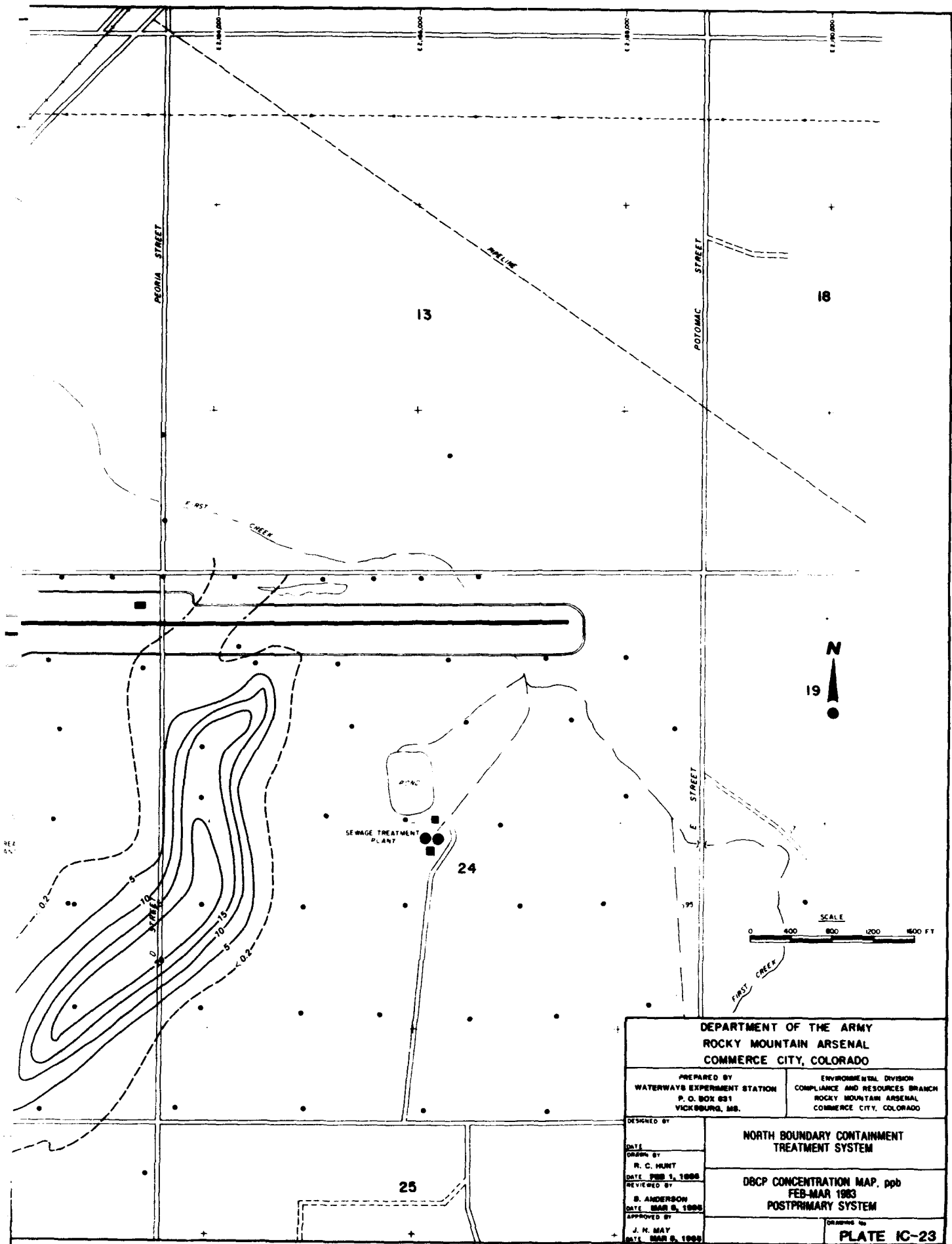




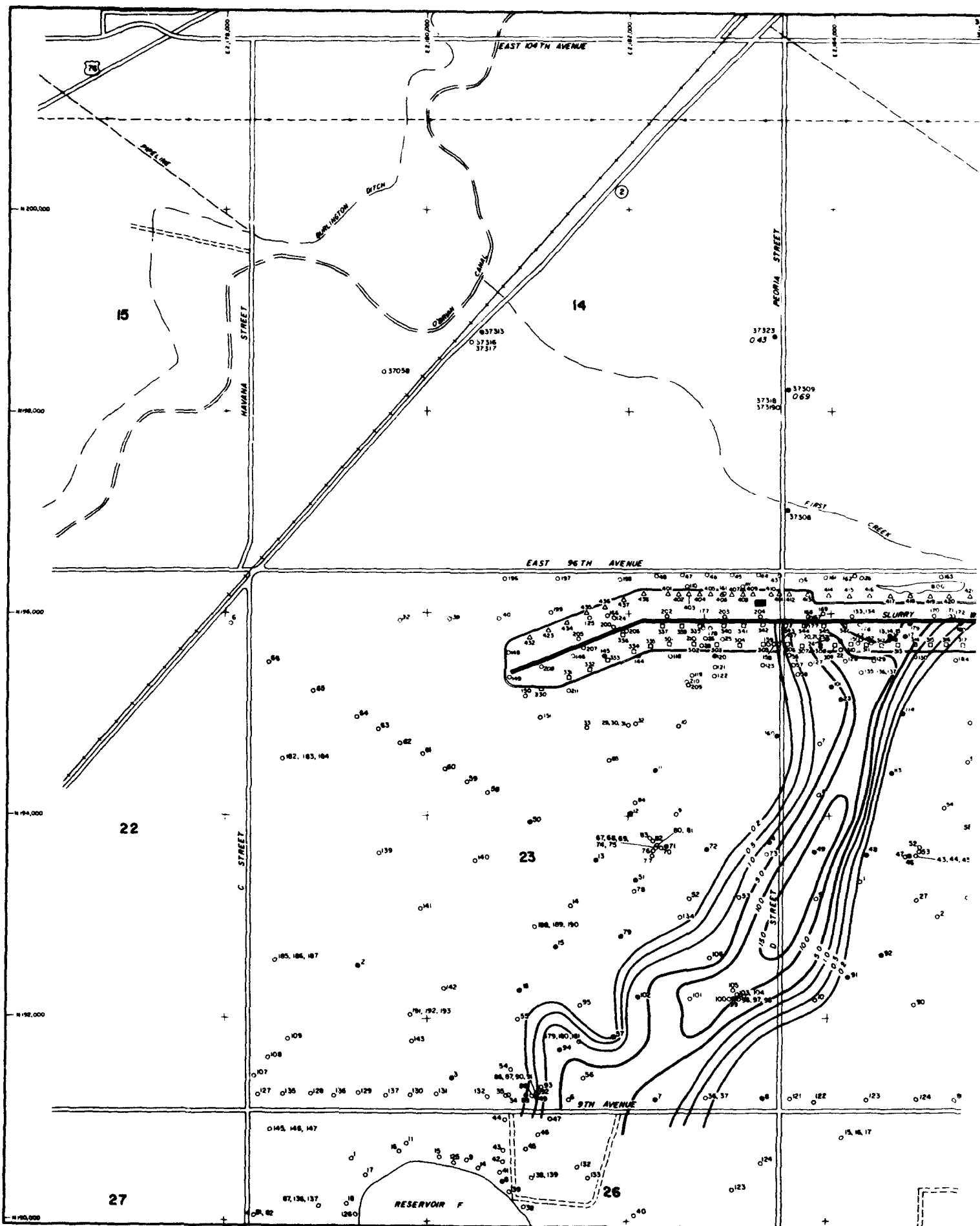


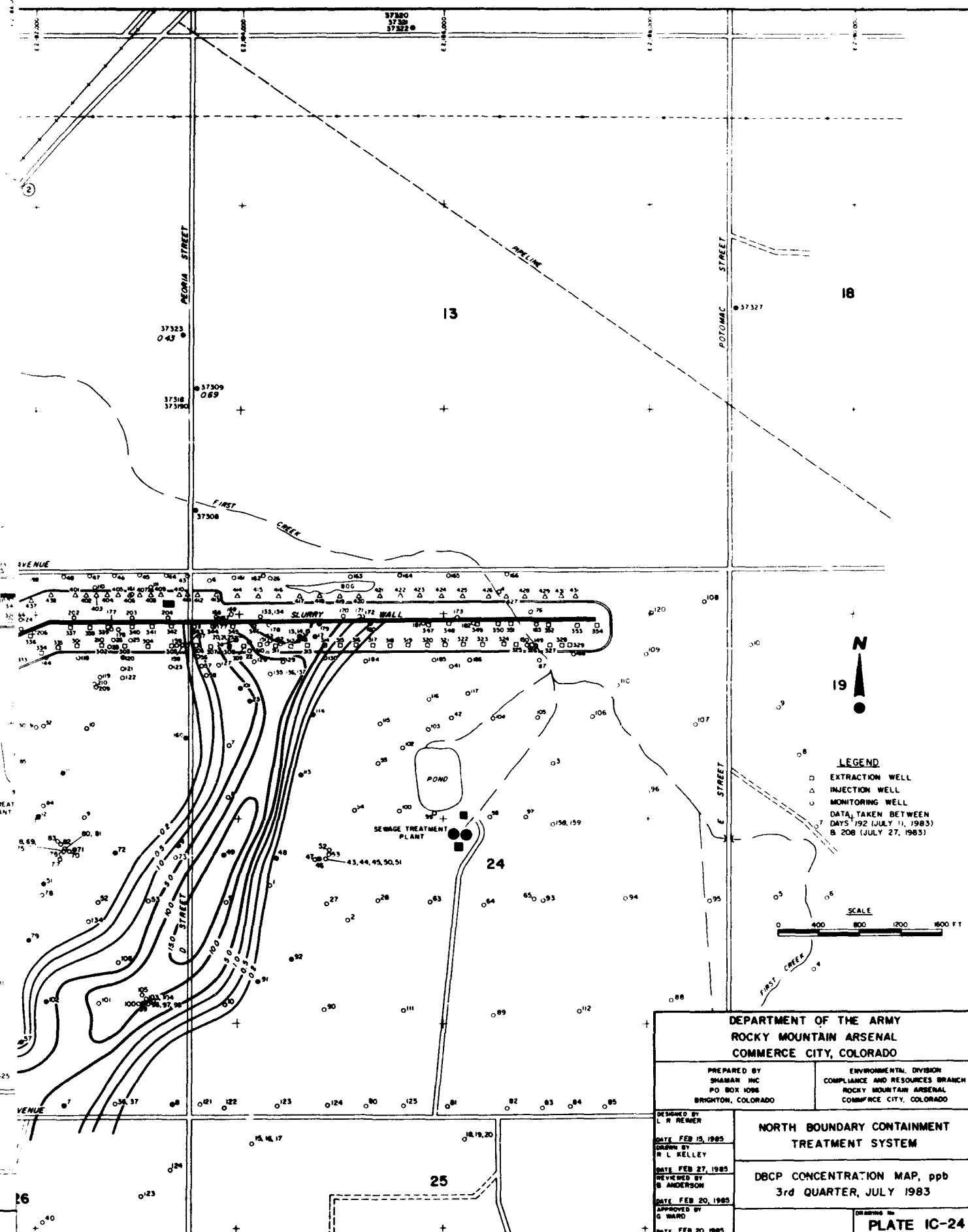


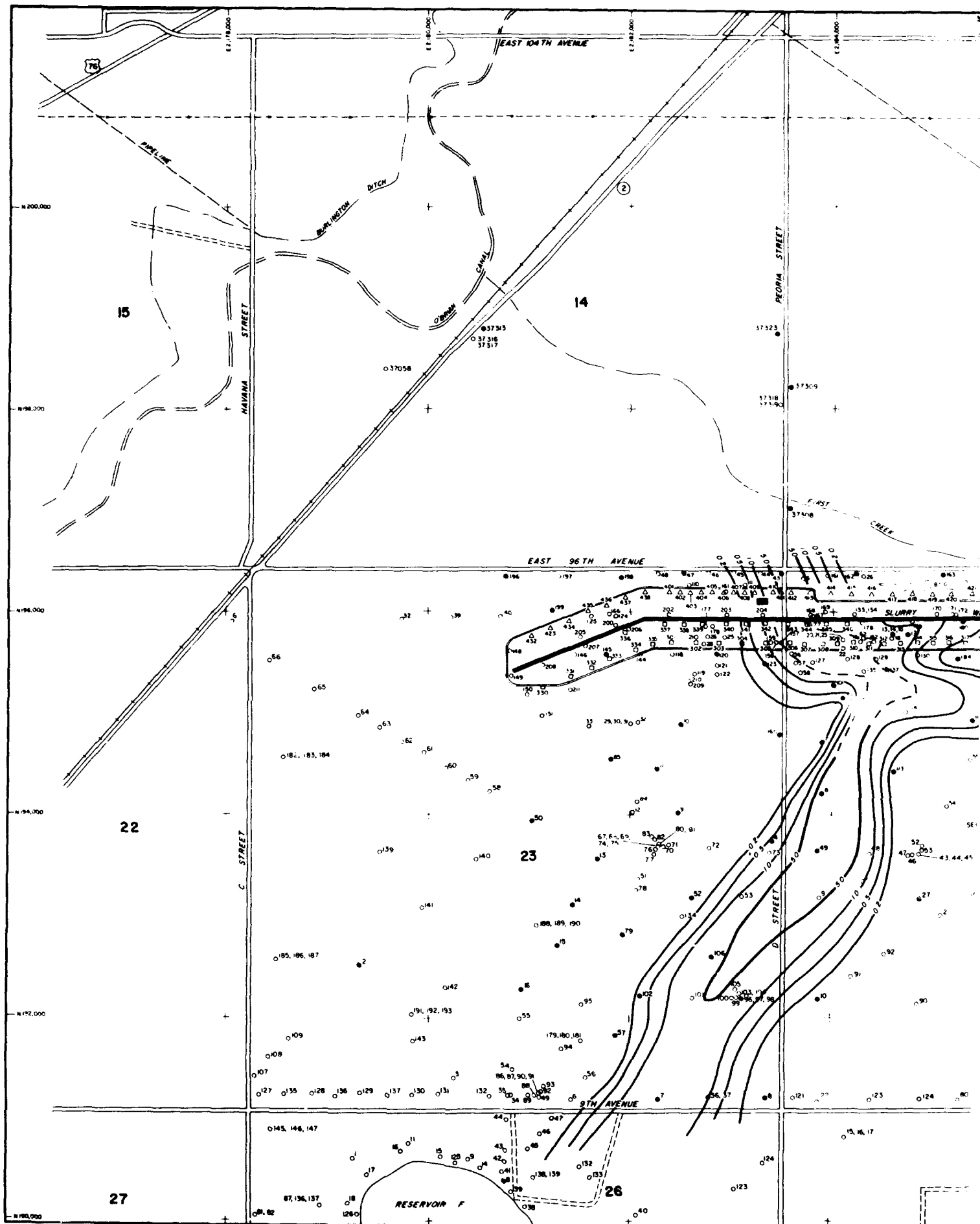


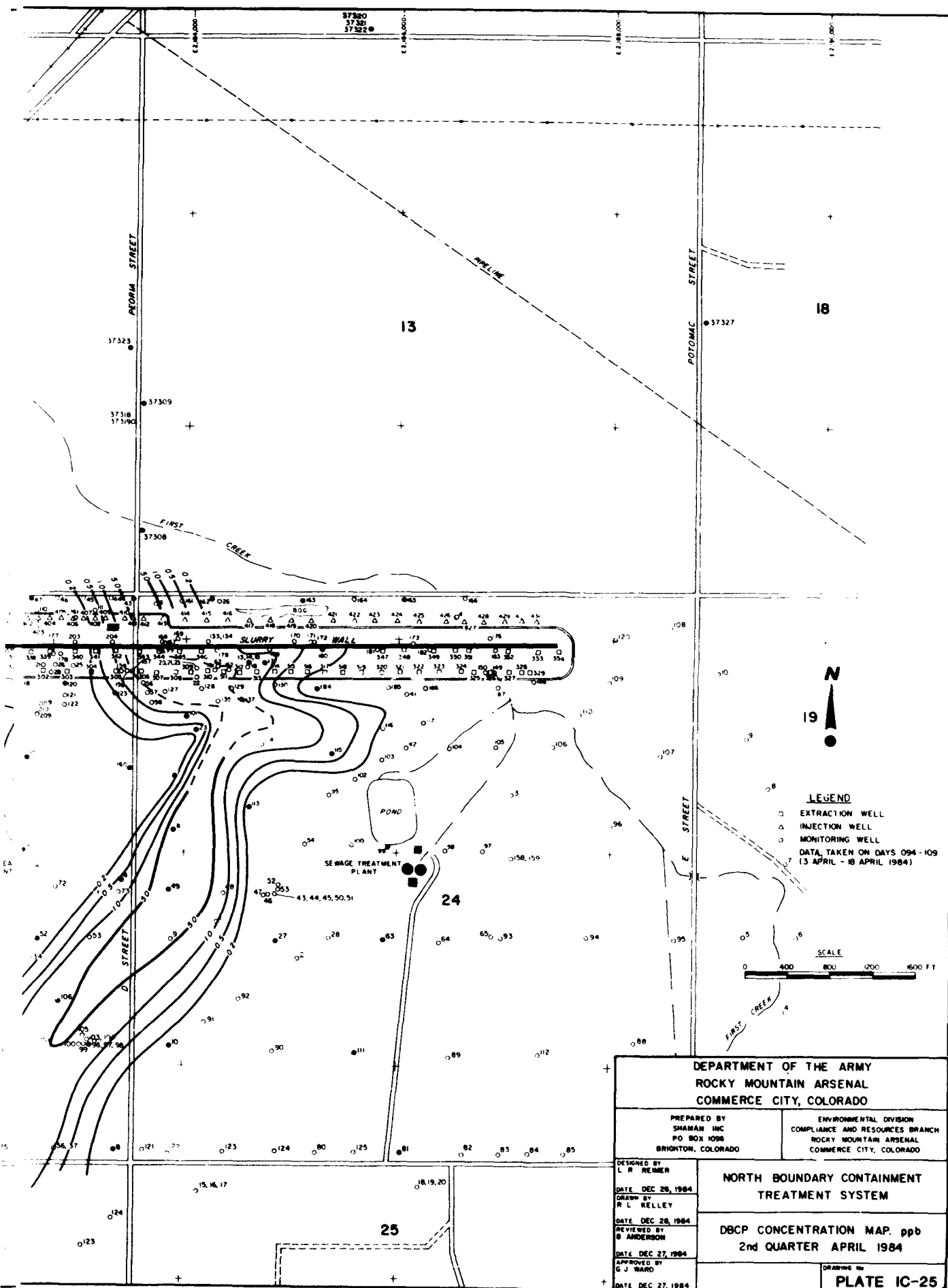


DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 631 VICKSBURG, MS.	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
DESIGNED BY DATE DRAWN BY R. C. HUNT DATE FEB 1, 1988 REVIEWED BY S. ANDERSON DATE MAR 6, 1988 APPROVED BY J. N. MAY DATE MAR 6, 1988	NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM DBCP CONCENTRATION MAP, ppb FEB-MAR 1983 POSTPRIMARY SYSTEM Drawing No. PLATE IC-23









DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
SHAWAN, INC.
P.O. BOX 1006
BRIGHTON, COLORADO

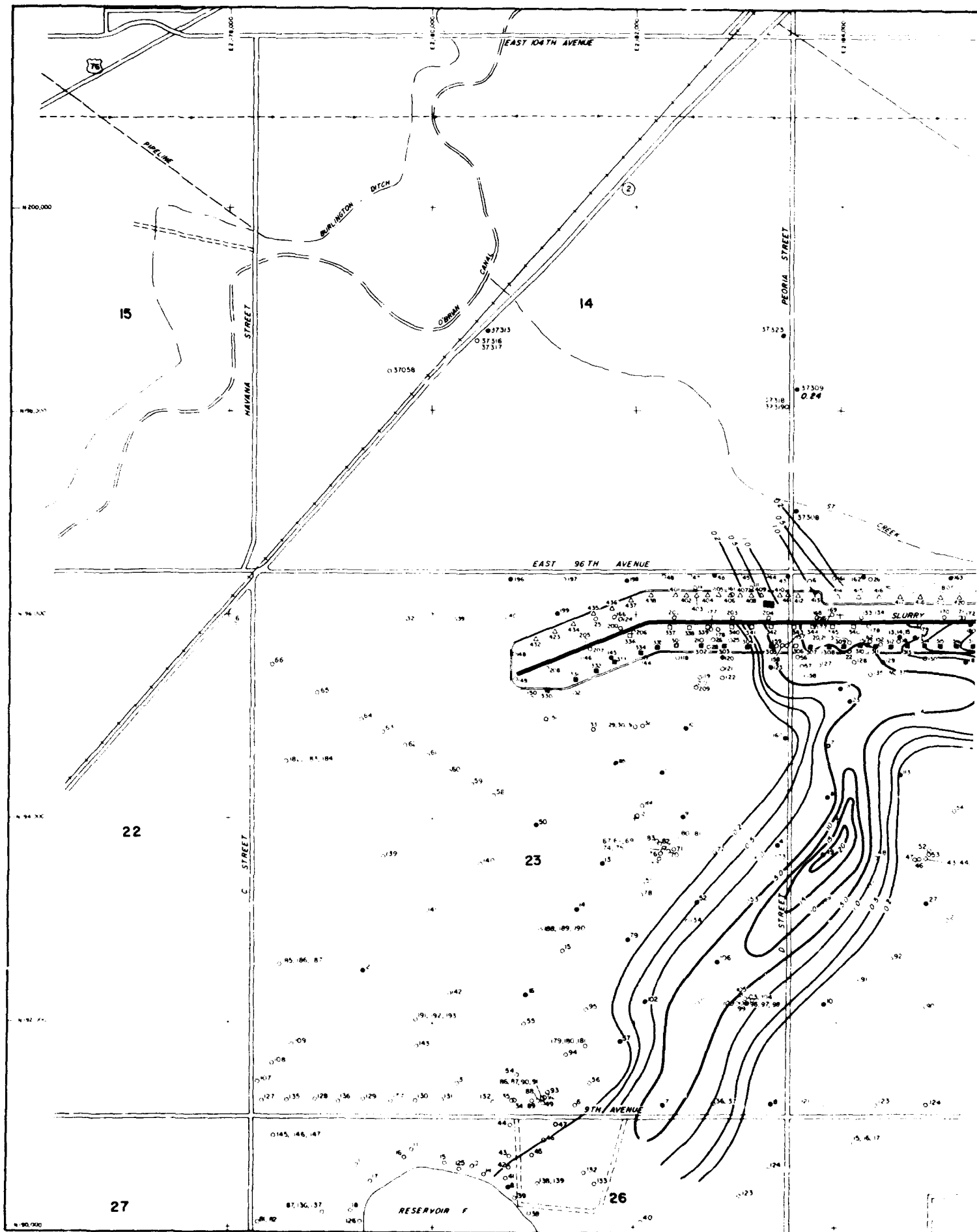
ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

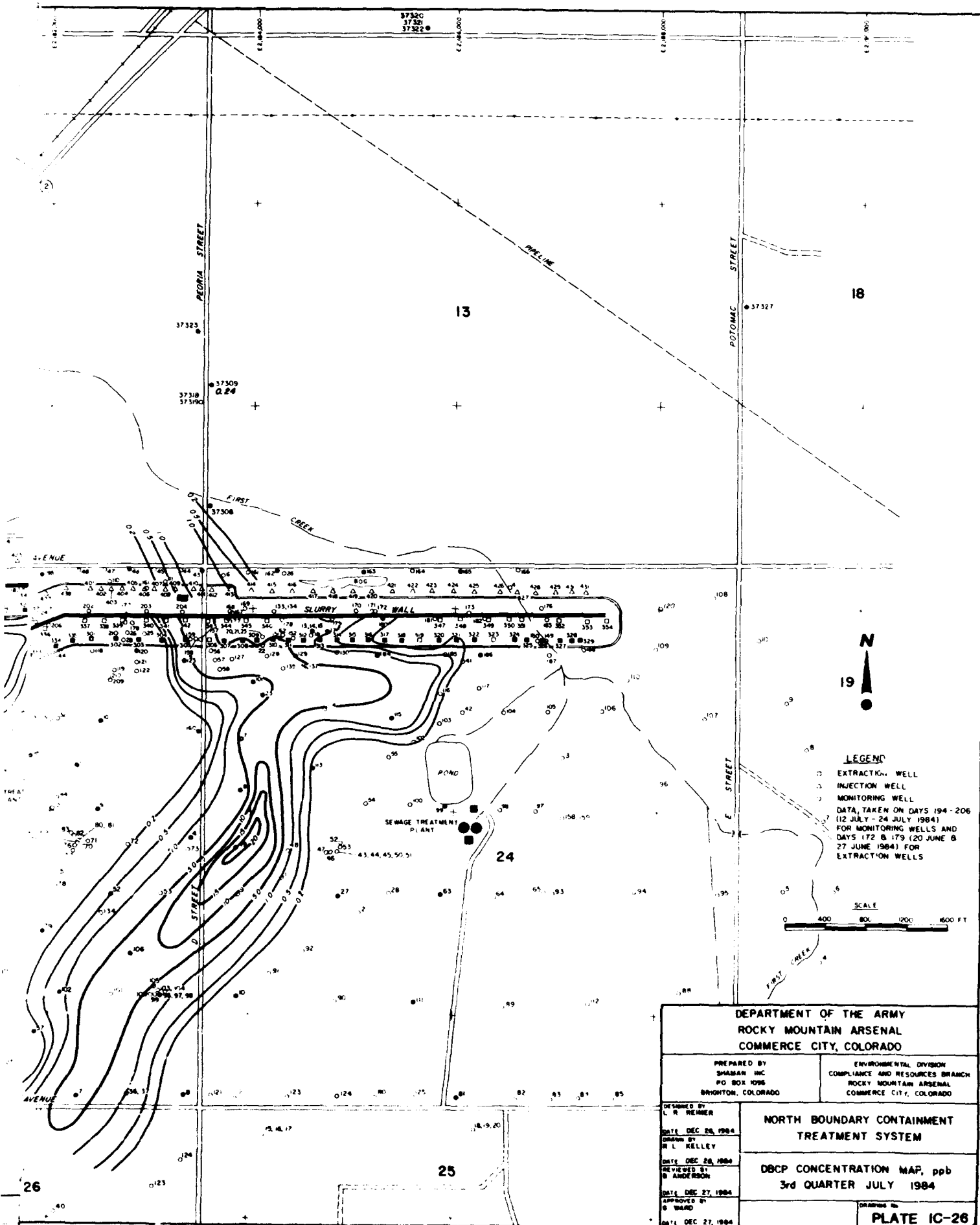
DESIGNED BY
L. R. REMER
DATE DEC 26, 1984
DRAWN BY
R. L. KELLEY
DATE DEC 26, 1984
REVIEWED BY
B. ANDERSON
DATE DEC 27, 1984
APPROVED BY
G. J. WARD
DATE DEC 27, 1984

NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM

DBCP CONCENTRATION MAP. ppb
2nd QUARTER APRIL 1984

DRAWING NO.
PLATE IC-25





LEGEND

- EXTRACTION WELL
- INJECTION WELL
- MONITORING WELL
- DATA TAKEN ON DAYS 194 - 206 (12 JULY - 24 JULY 1984) FOR MONITORING WELLS AND DAYS 172 & 179 (20 JUNE & 27 JUNE 1984) FOR EXTRACTION WELLS

SCALE

0 400 800 1200 1600 FT

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
SHAWAN INC
PO BOX 1098
BRIGHTON, COLORADO

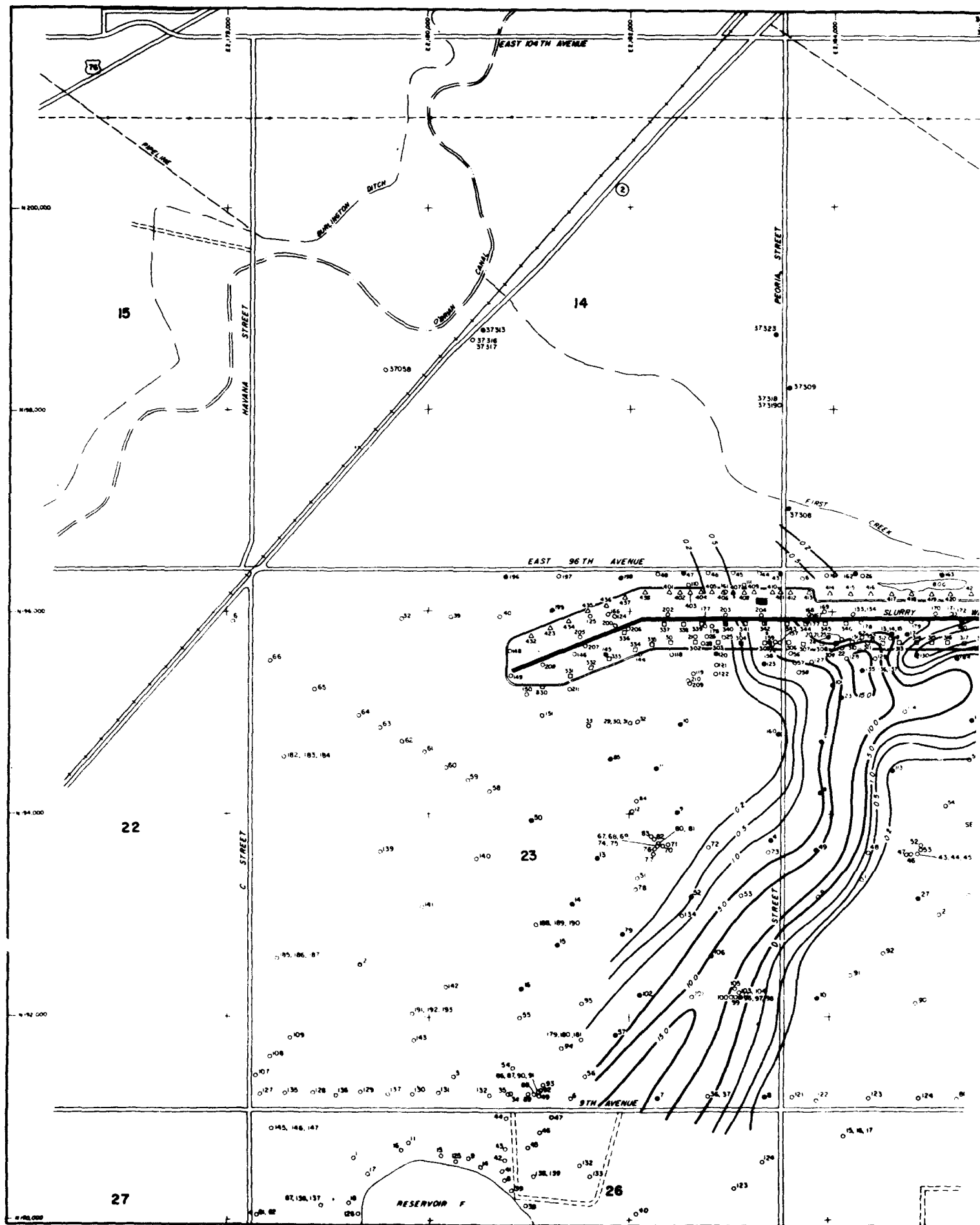
ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

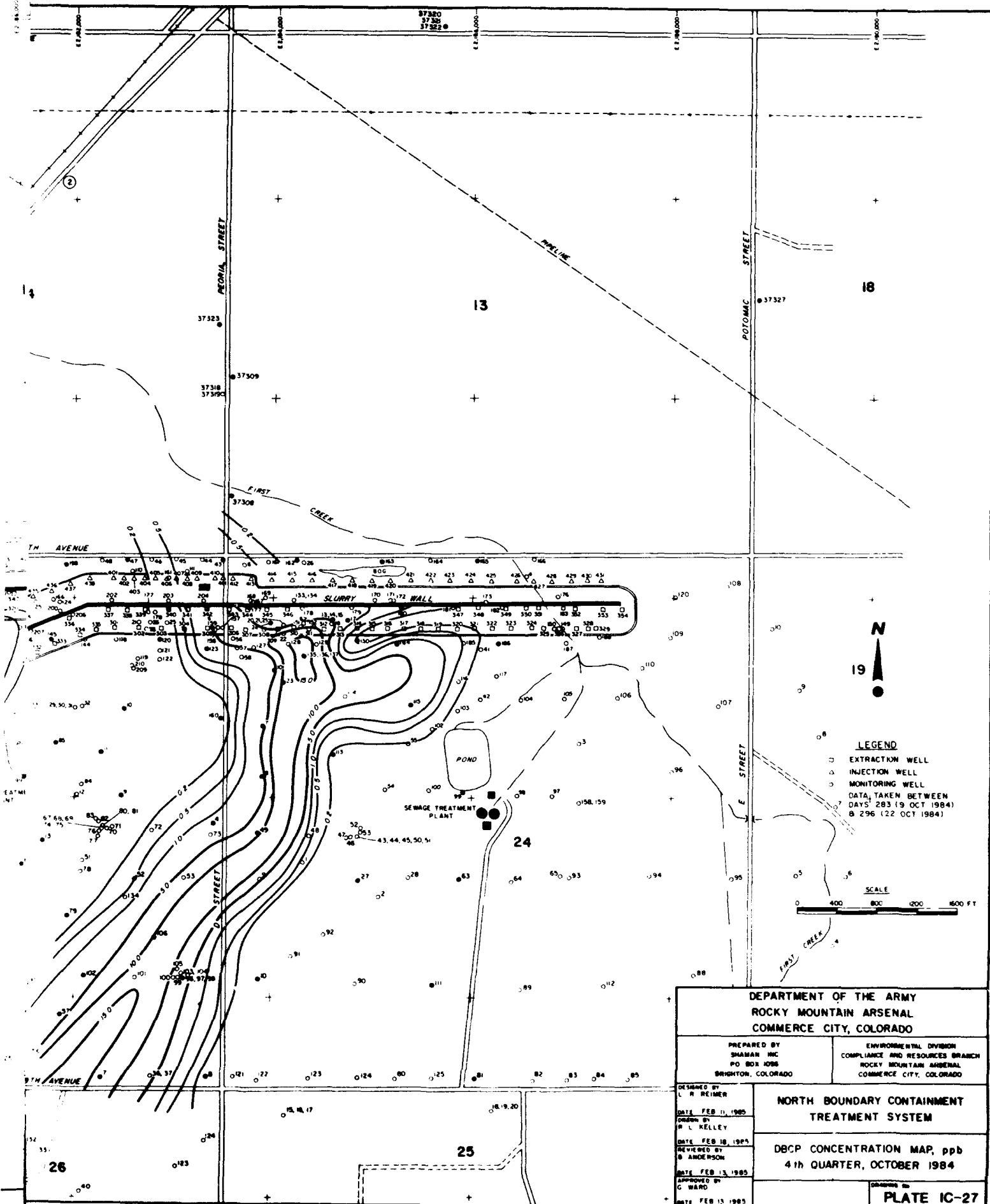
DESIGNED BY
L. R. REIMER
DATE DEC 26, 1984
DRAWN BY
R. L. KELLEY
DATE DEC 26, 1984
REVISED BY
B. ANDERSON
DATE DEC 27, 1984
APPROVED BY
B. WALSH
DATE DEC 27, 1984

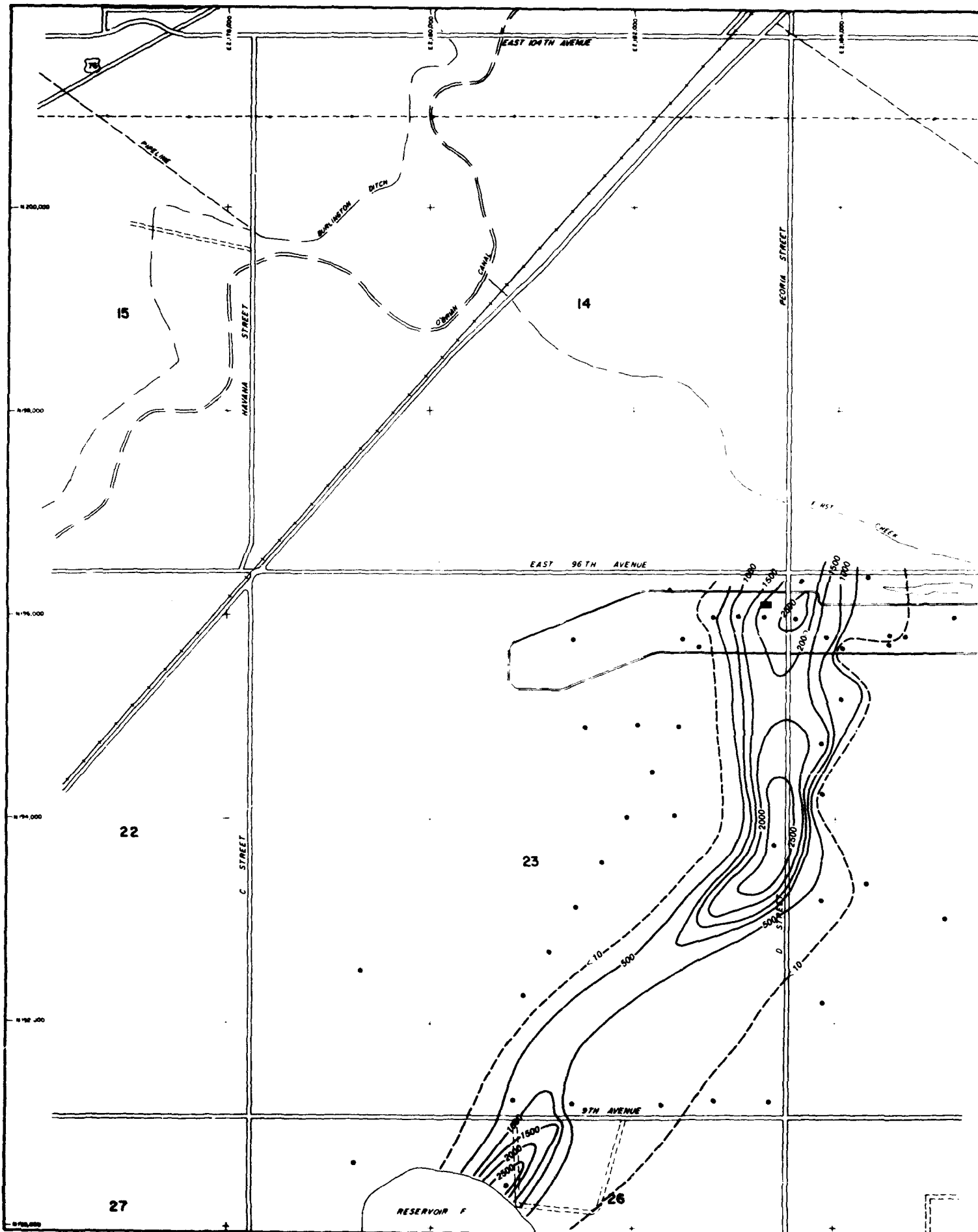
**NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM**

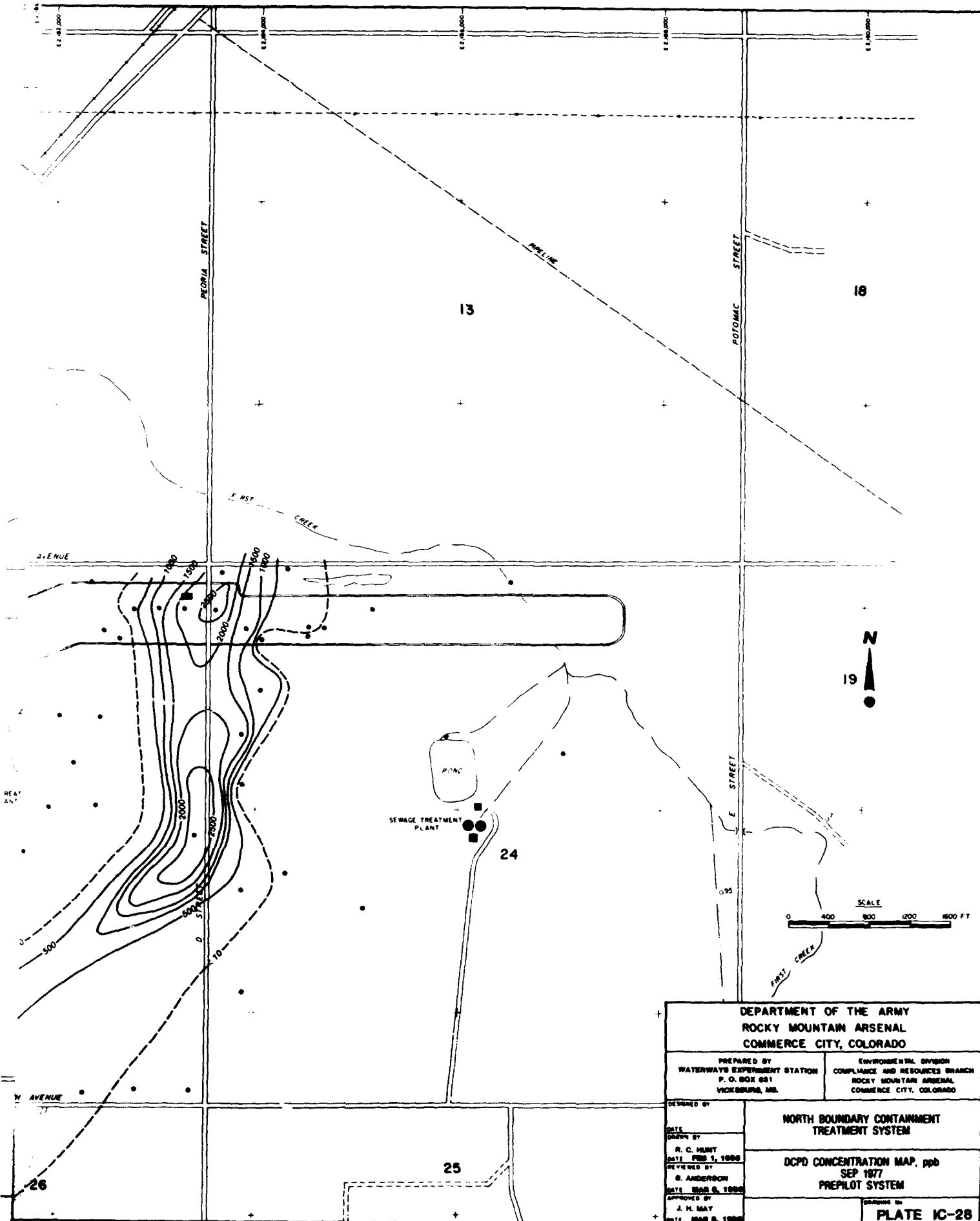
**DBCP CONCENTRATION MAP, ppb
3rd QUARTER JULY 1984**

DRAWING NO.
PLATE IC-26









DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
WATERWAYS EXPERIMENT STATION
P. O. BOX 651
VICKSBURG, MS.

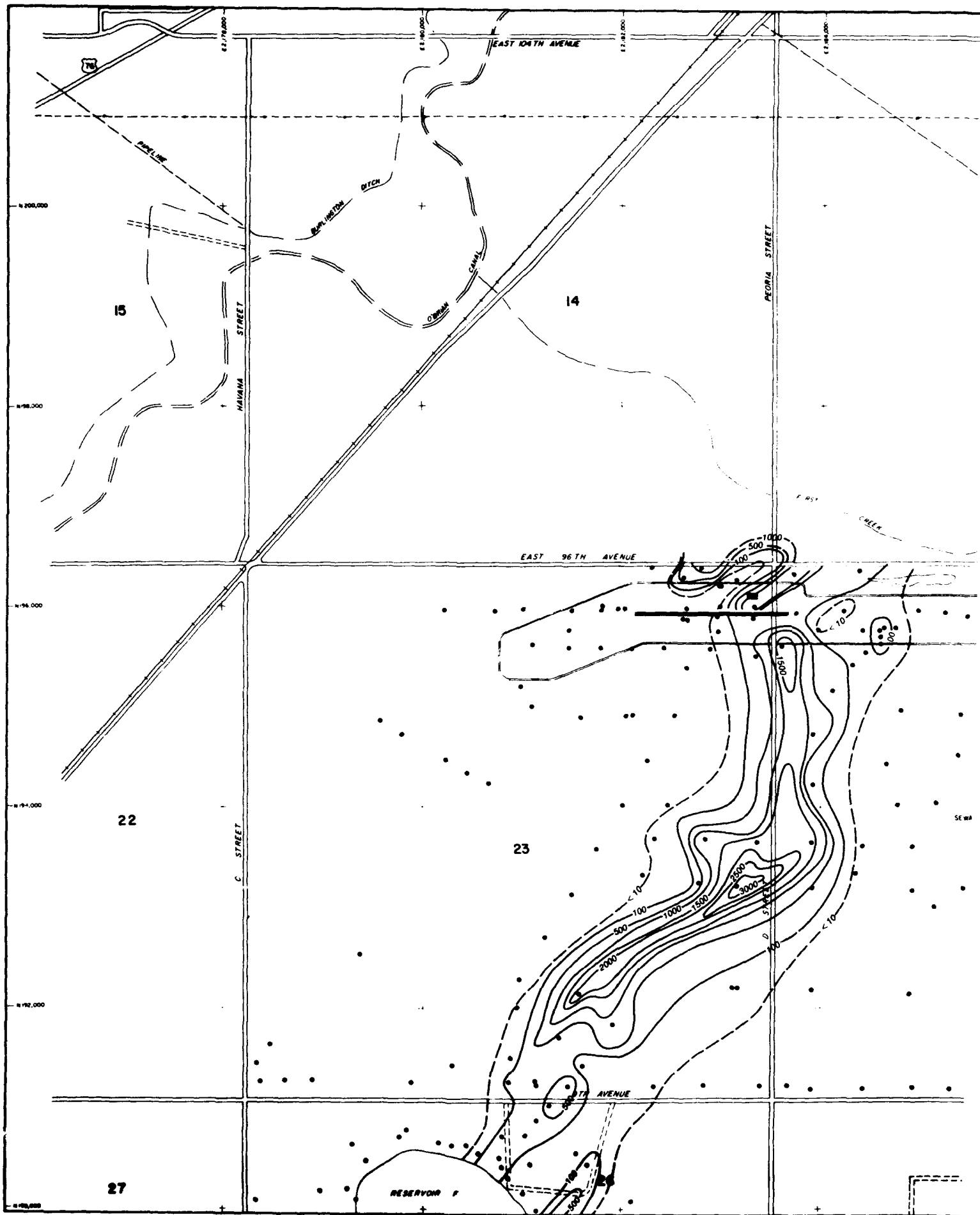
ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

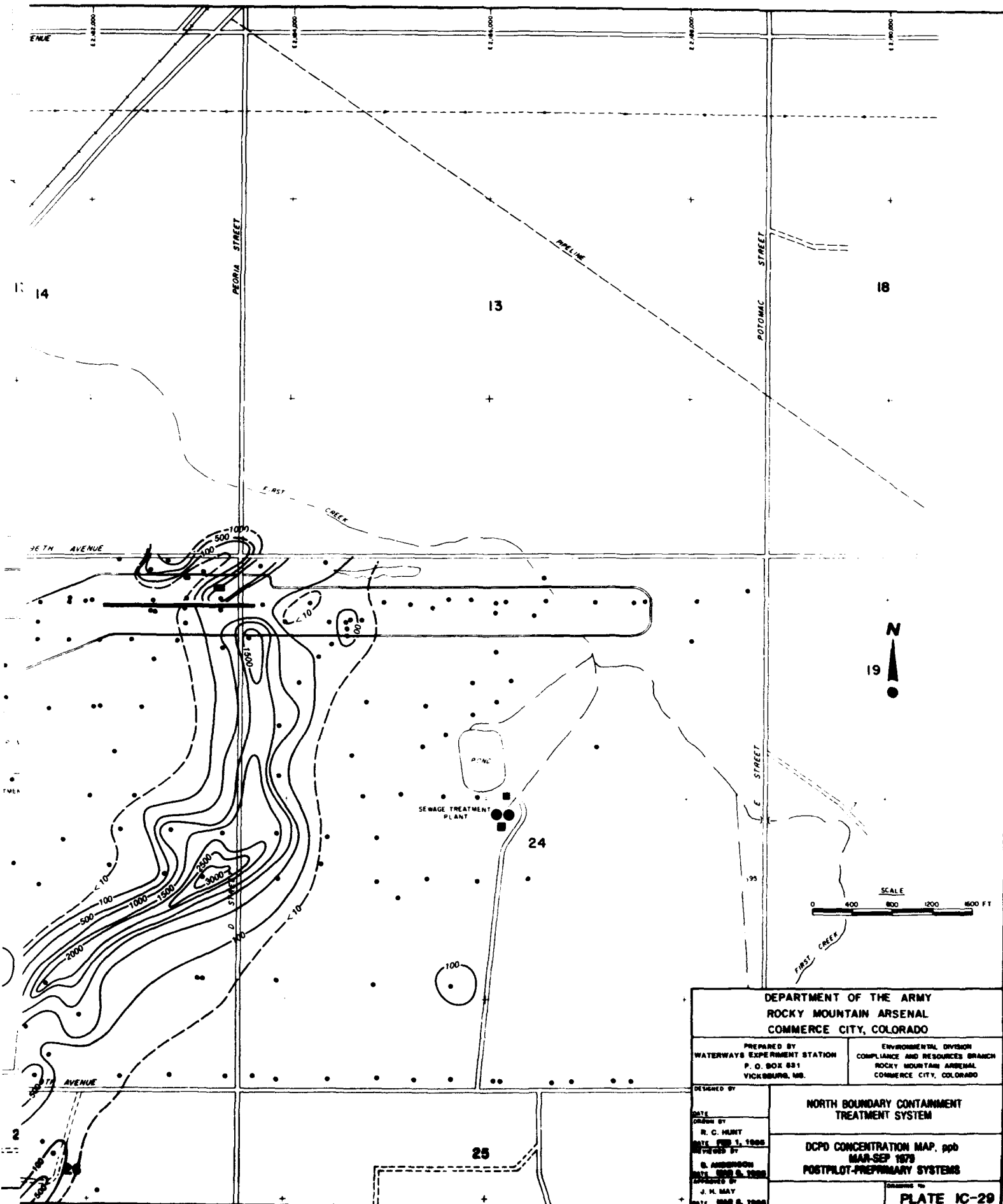
DESIGNED BY
DATE
CHECKED BY
R. C. HUNT
DATE FEB 1, 1986
REVIEWED BY
S. ANDERSON
DATE MAR 8, 1986
APPROVED BY
J. H. MAY
DATE MAR 8, 1986

NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM

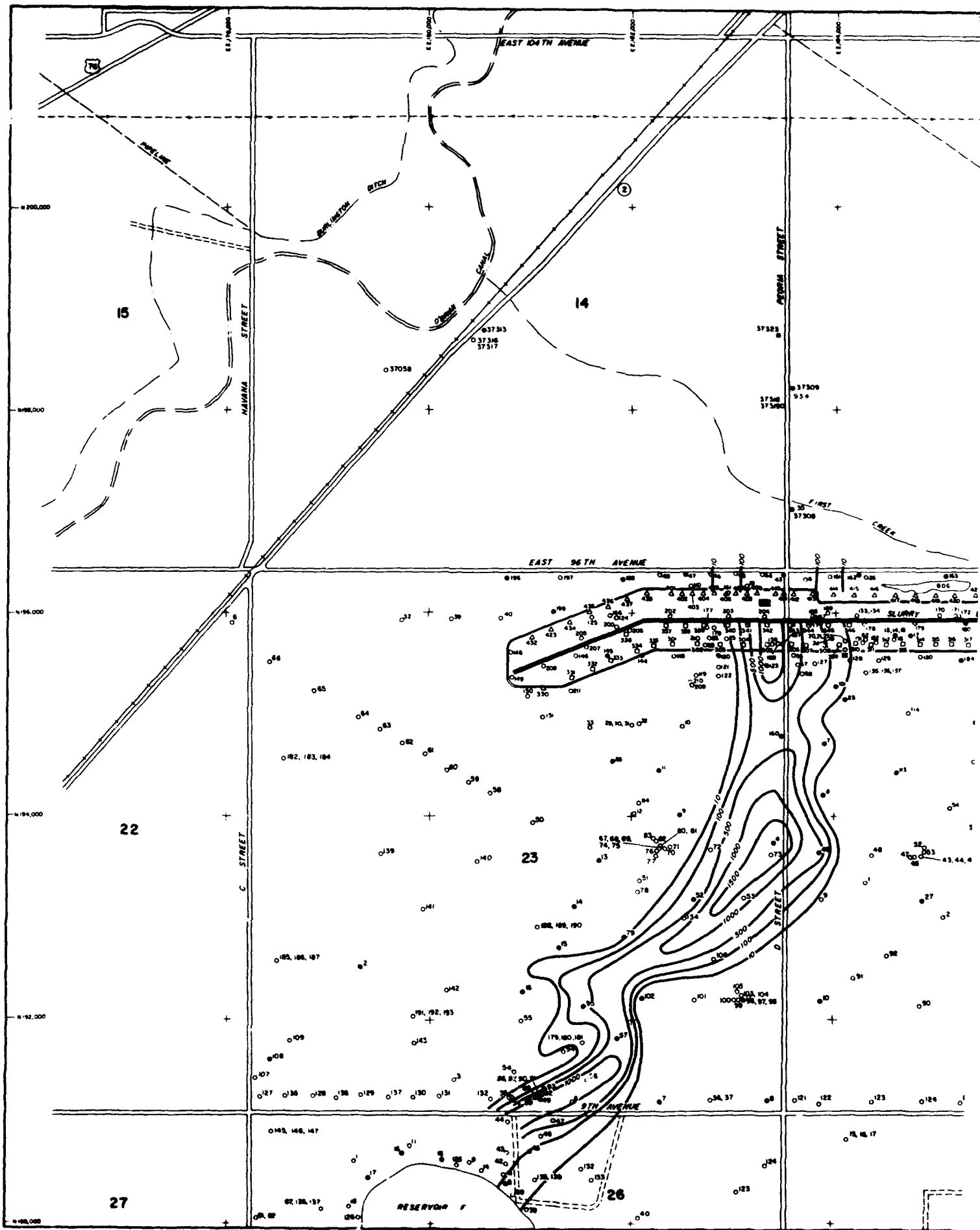
DCPD CONCENTRATION MAP, ppb
SEP 1977
PREPILOT SYSTEM

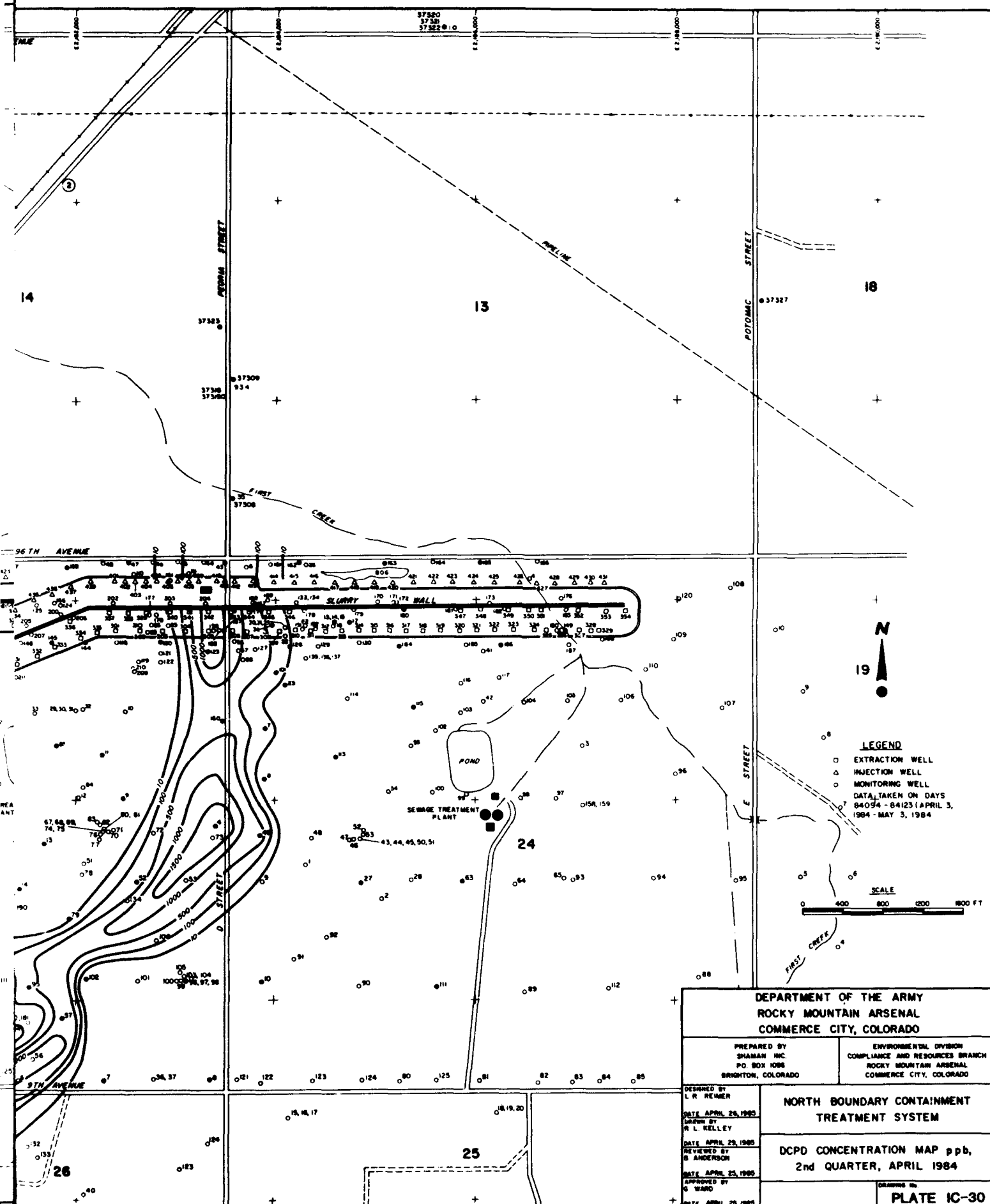
PLATE IC-28

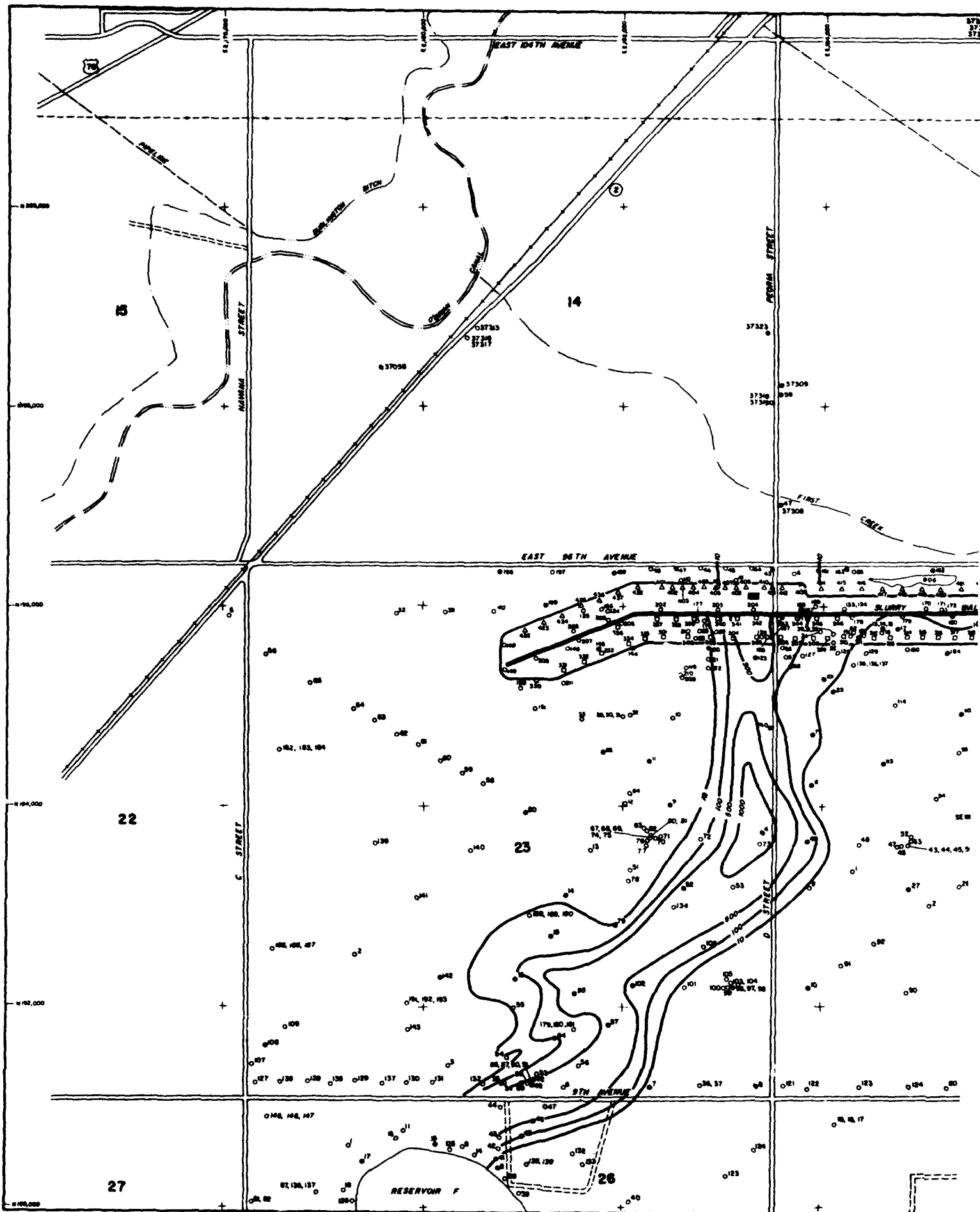


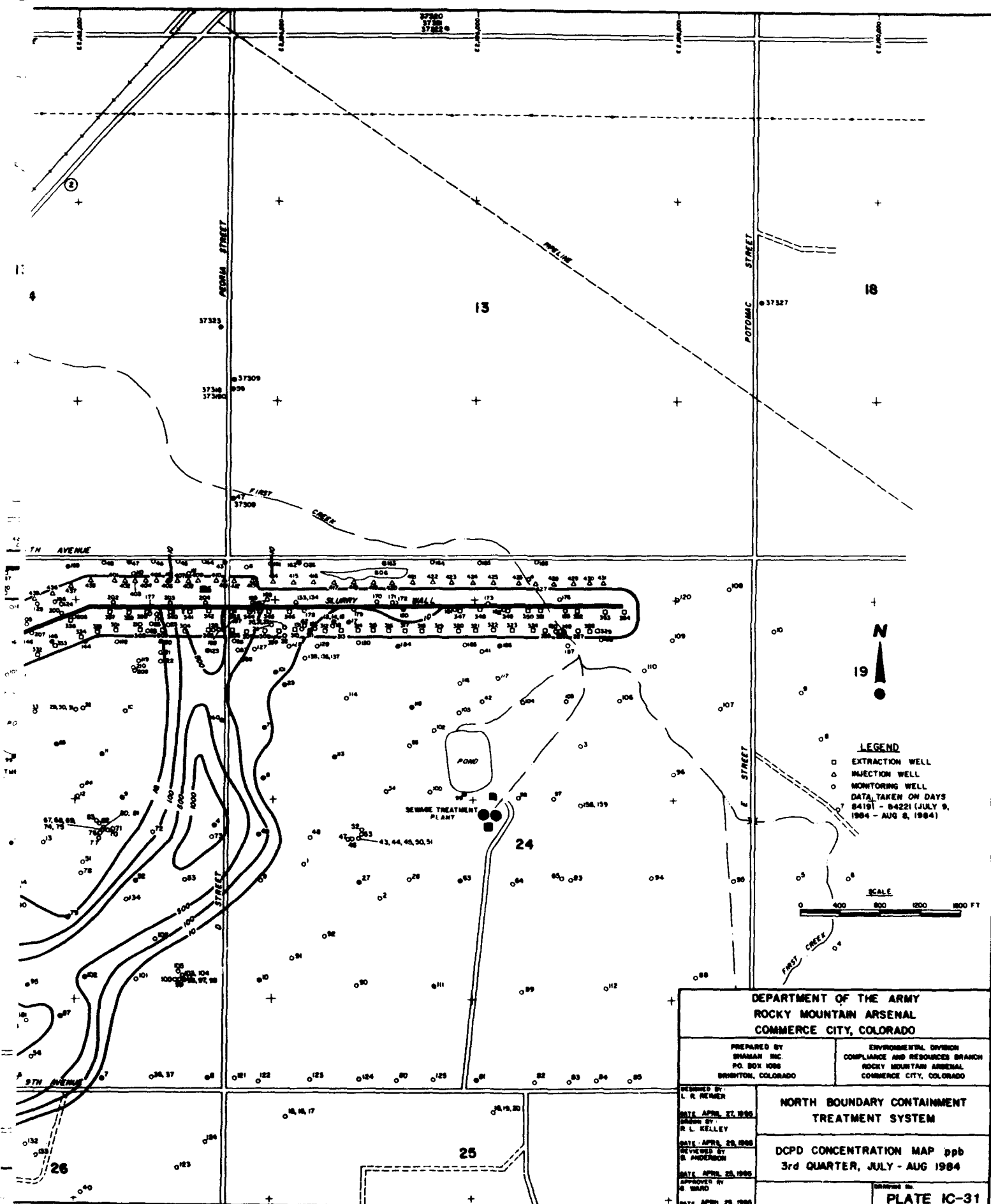


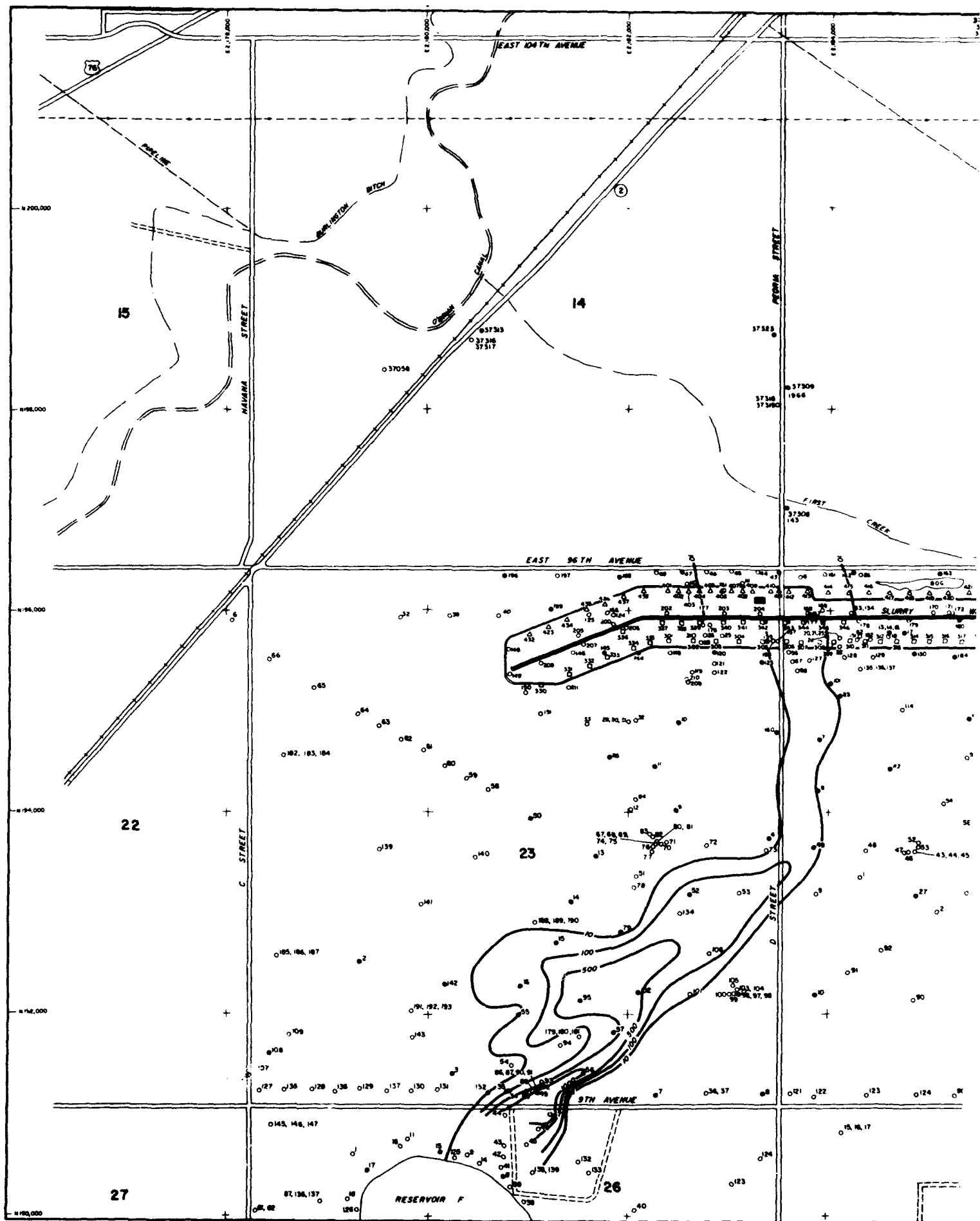
DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION P. O. BOX 881 VICKSBURG, MS.	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
DESIGNED BY DATE DRAWN BY R. C. HUNT DATE FEB 1, 1968 REVIEWED BY S. ANDERSON DATE MAR 5, 1968 CHECKED BY J. H. MAY DATE MAR 5, 1968	NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM DCPD CONCENTRATION MAP, ppb MAR-SEP 1979 POSTPILOT-PREPRIMARY SYSTEMS DRAWING NO. PLATE IC-29

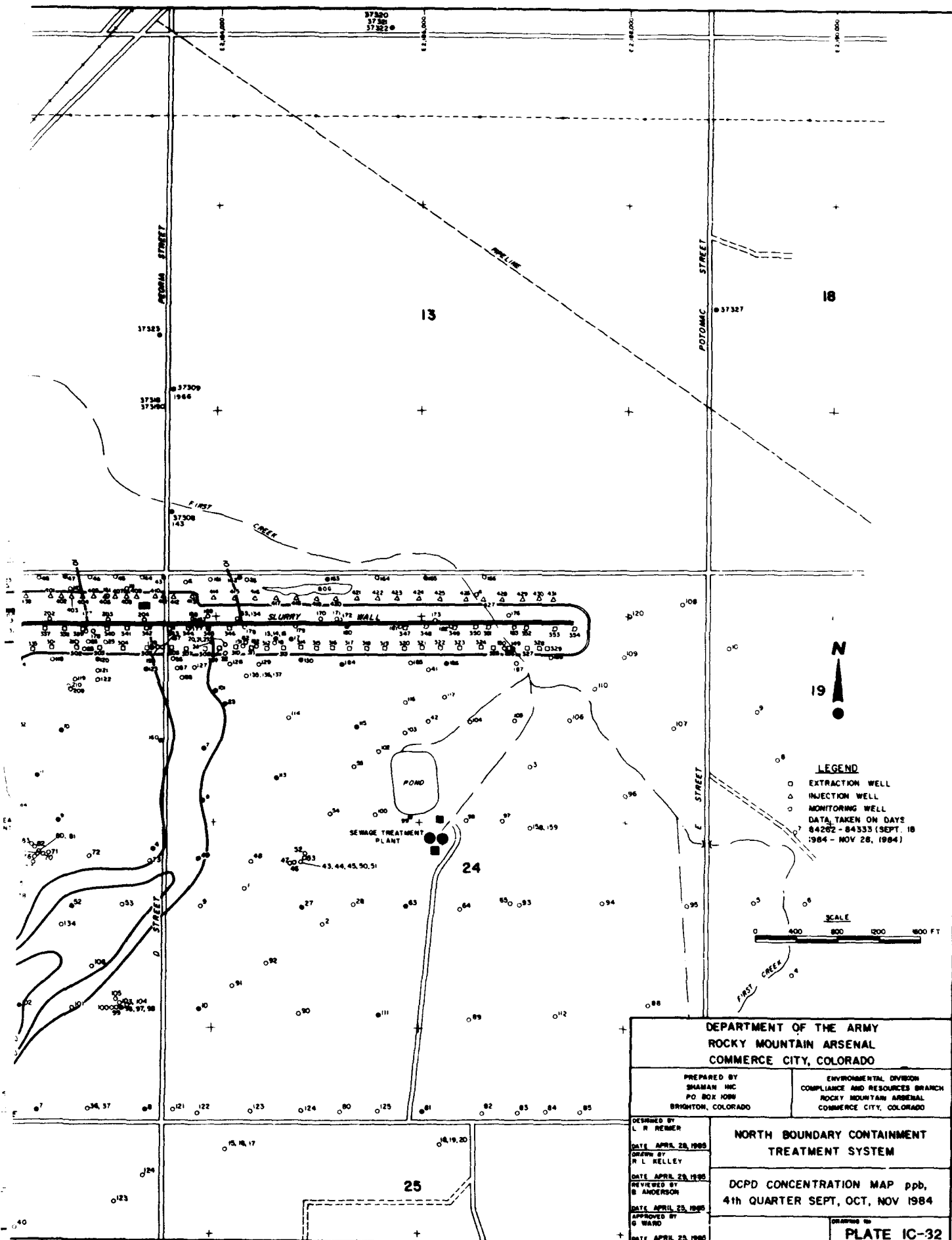


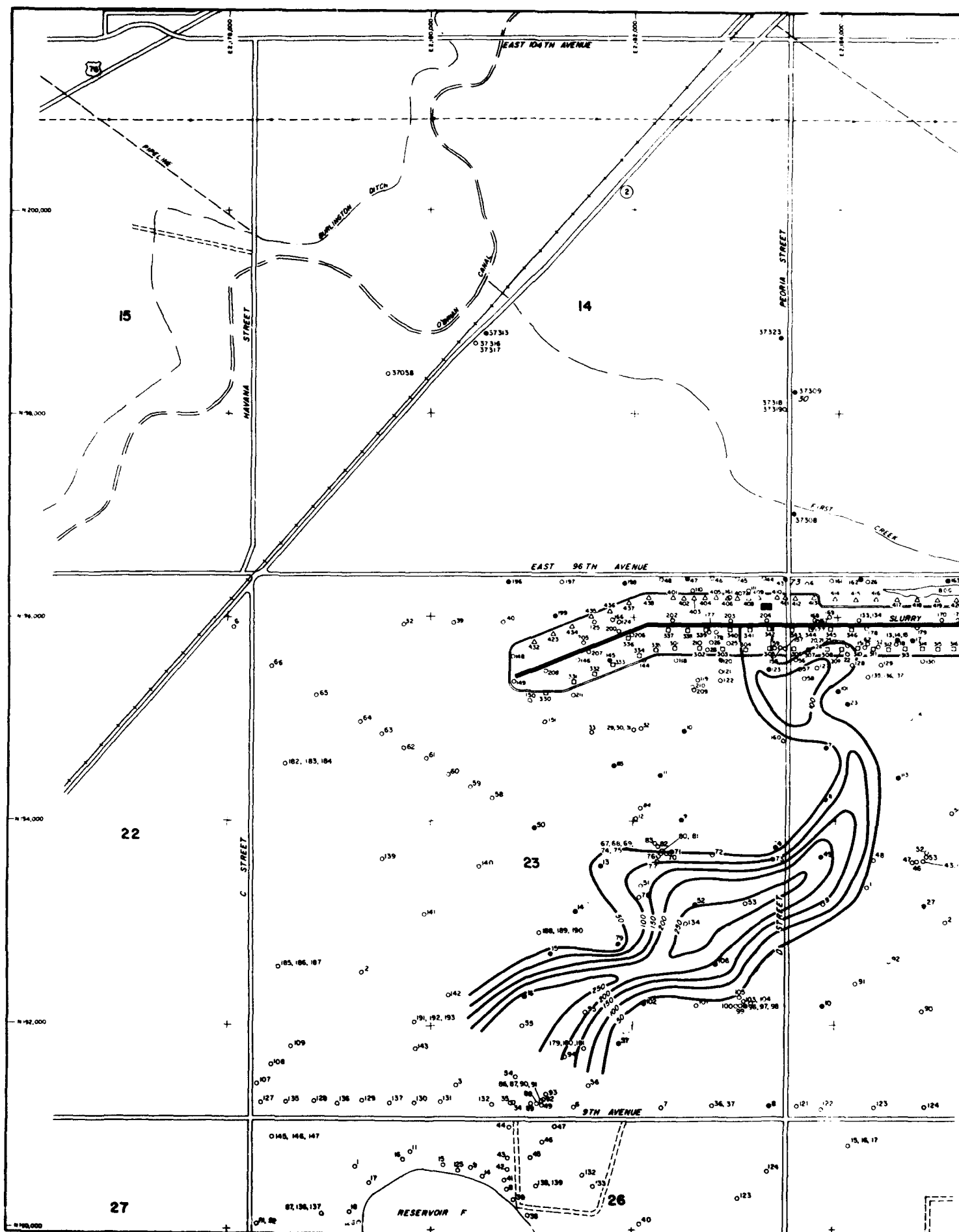


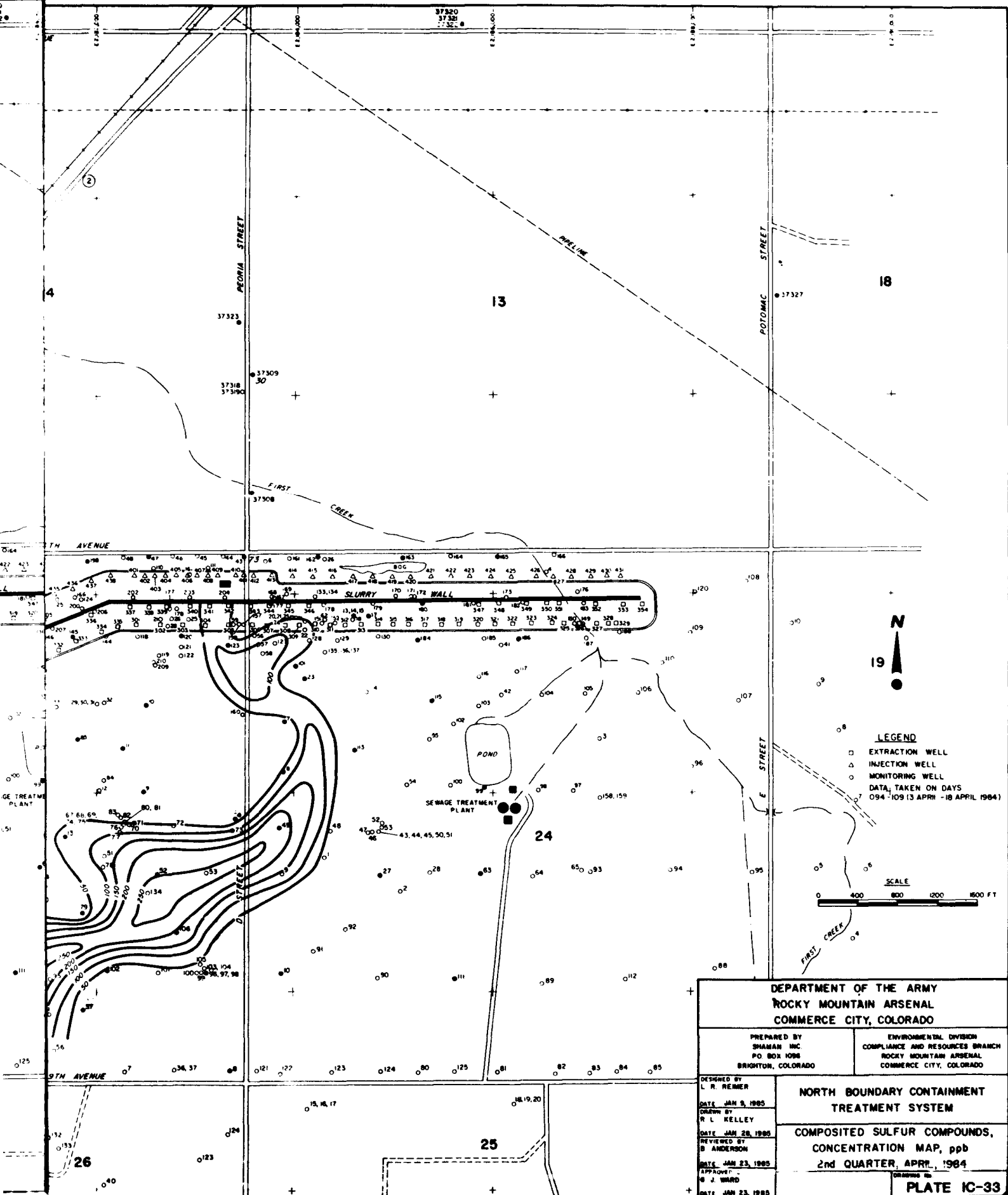


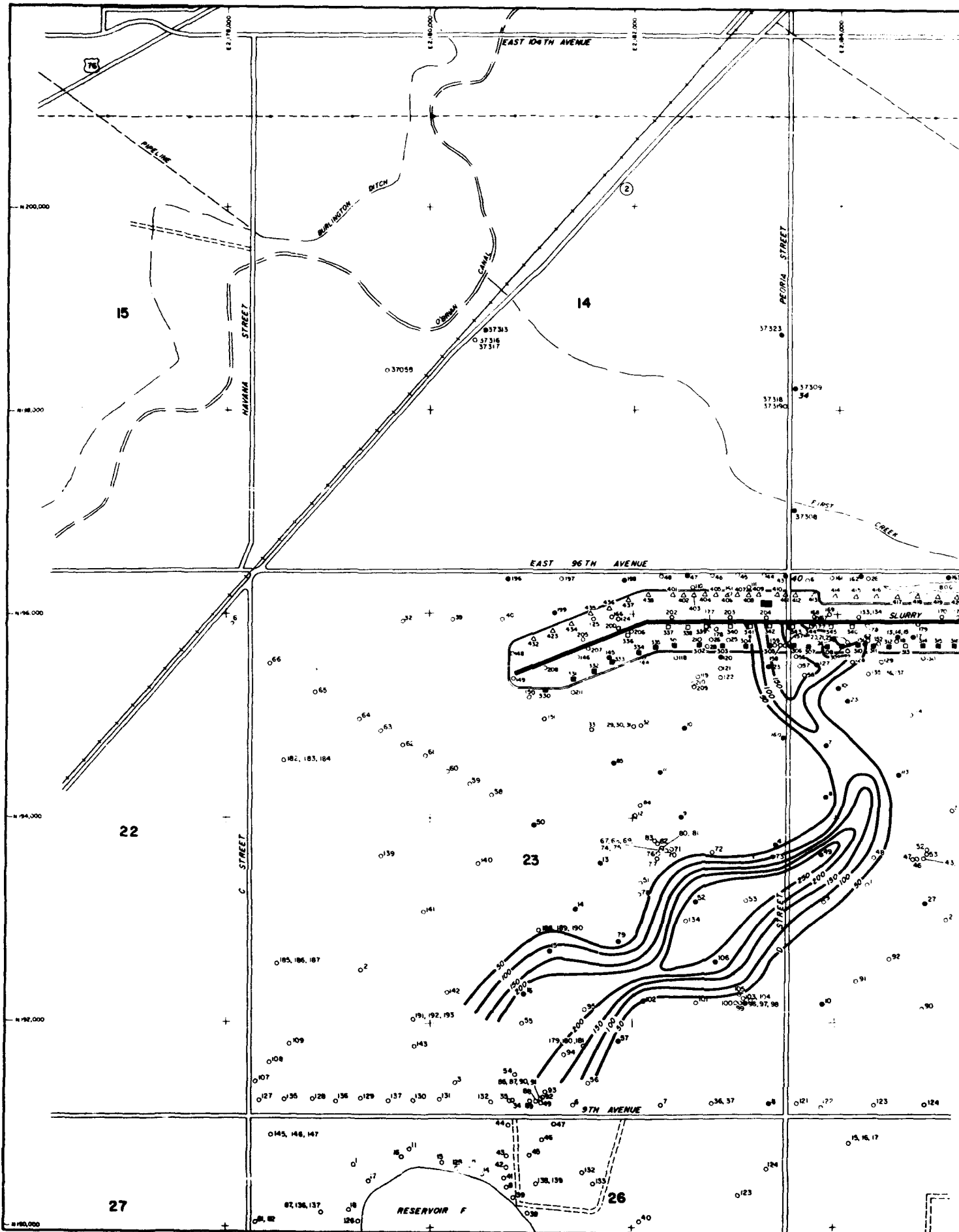


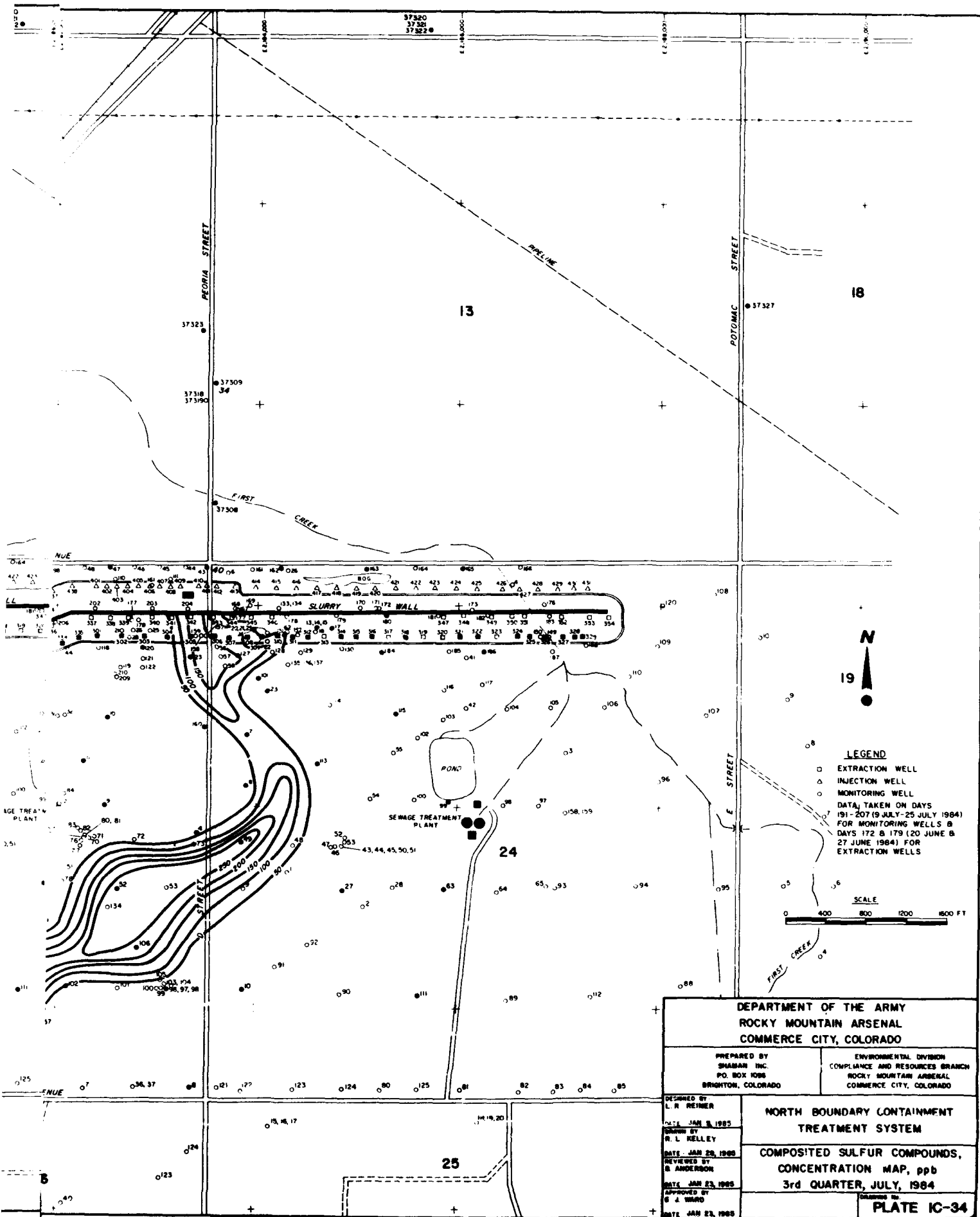


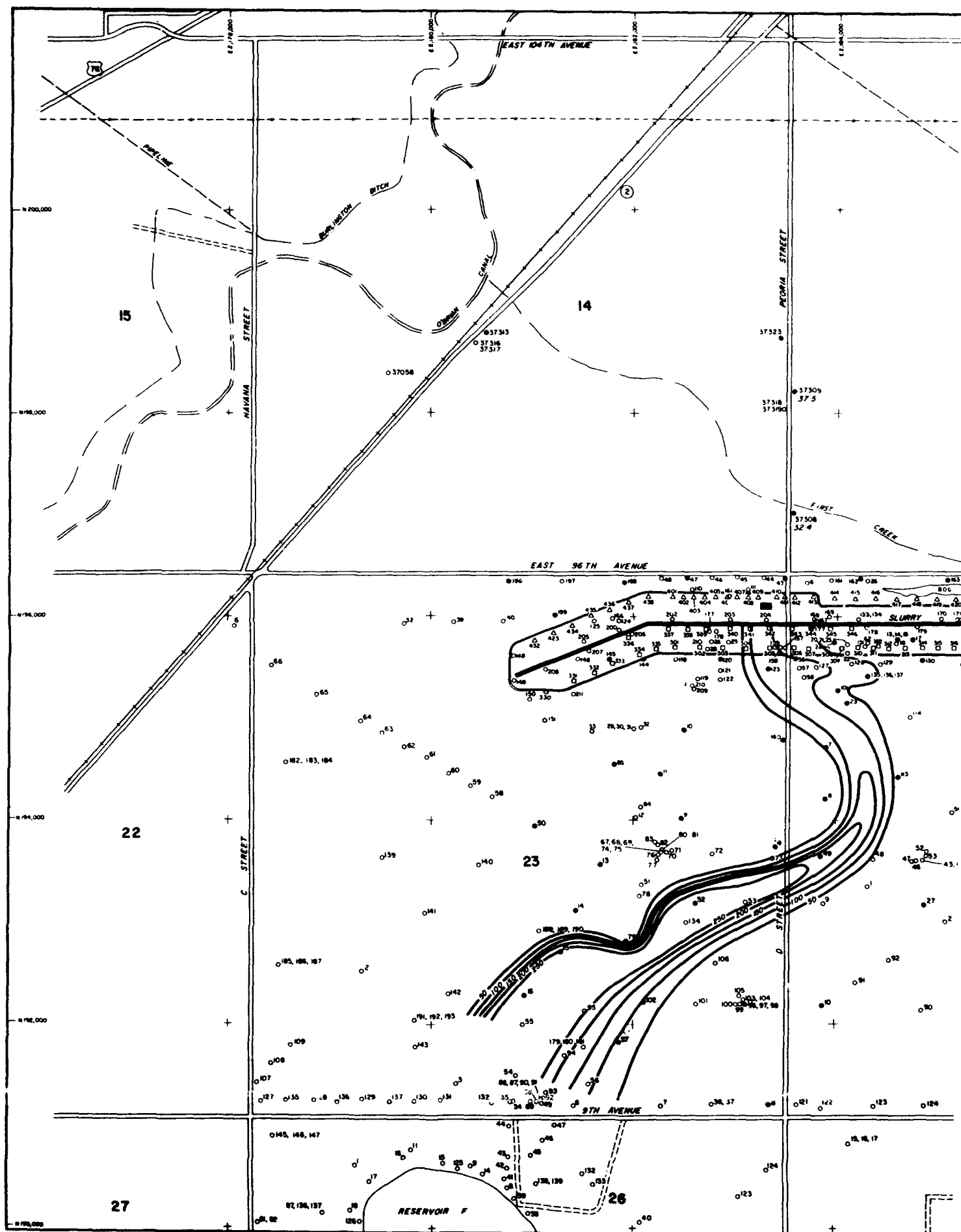


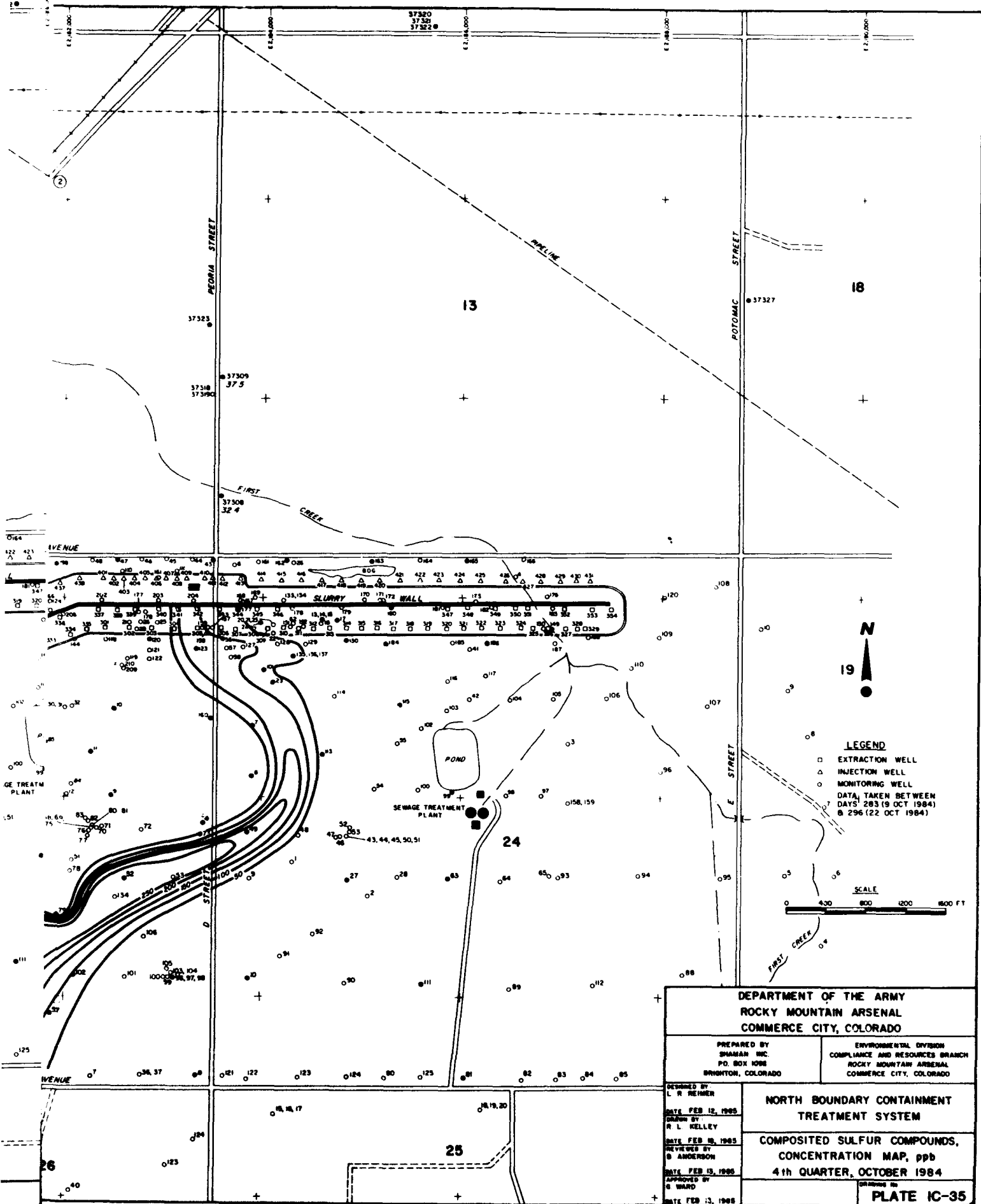


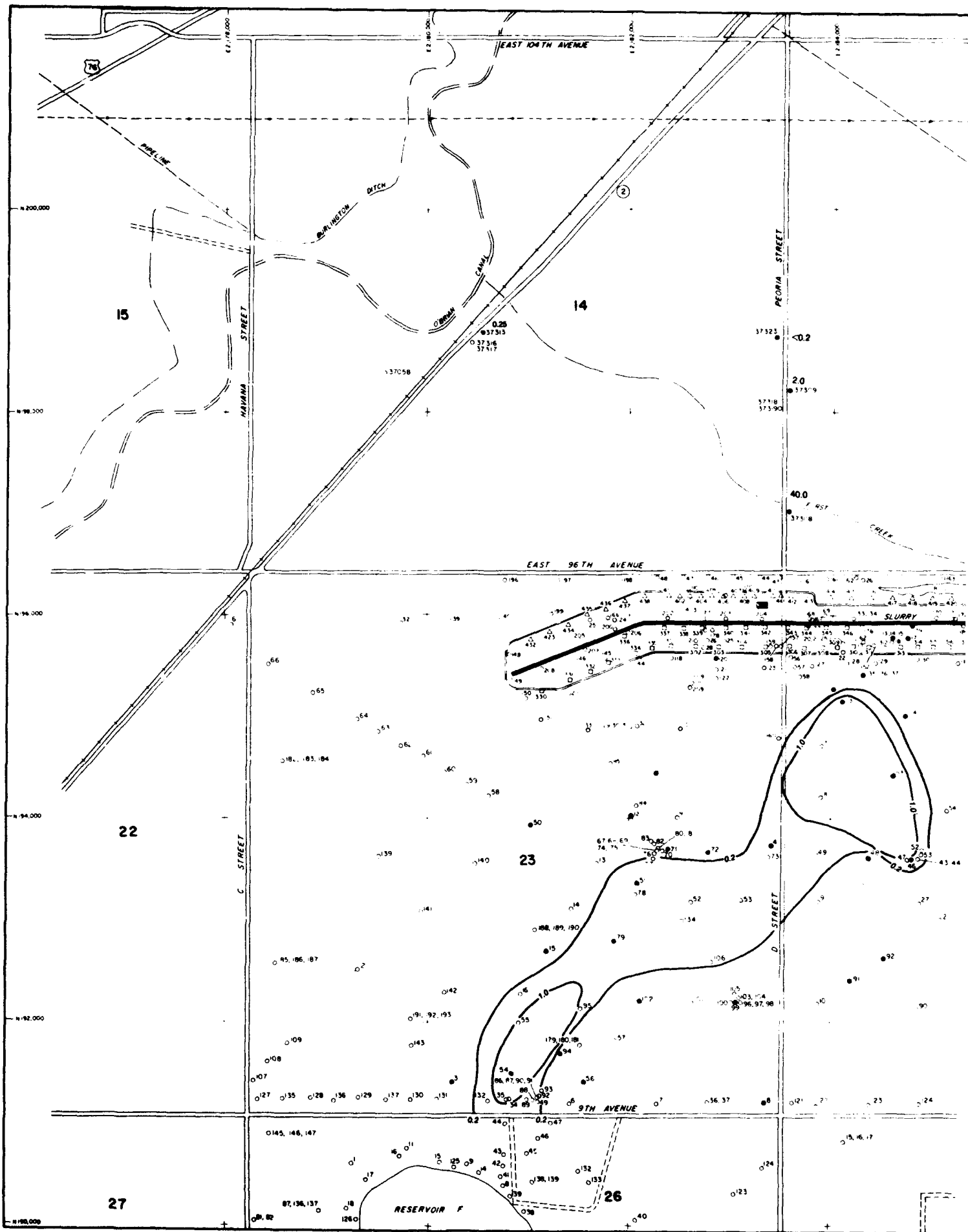


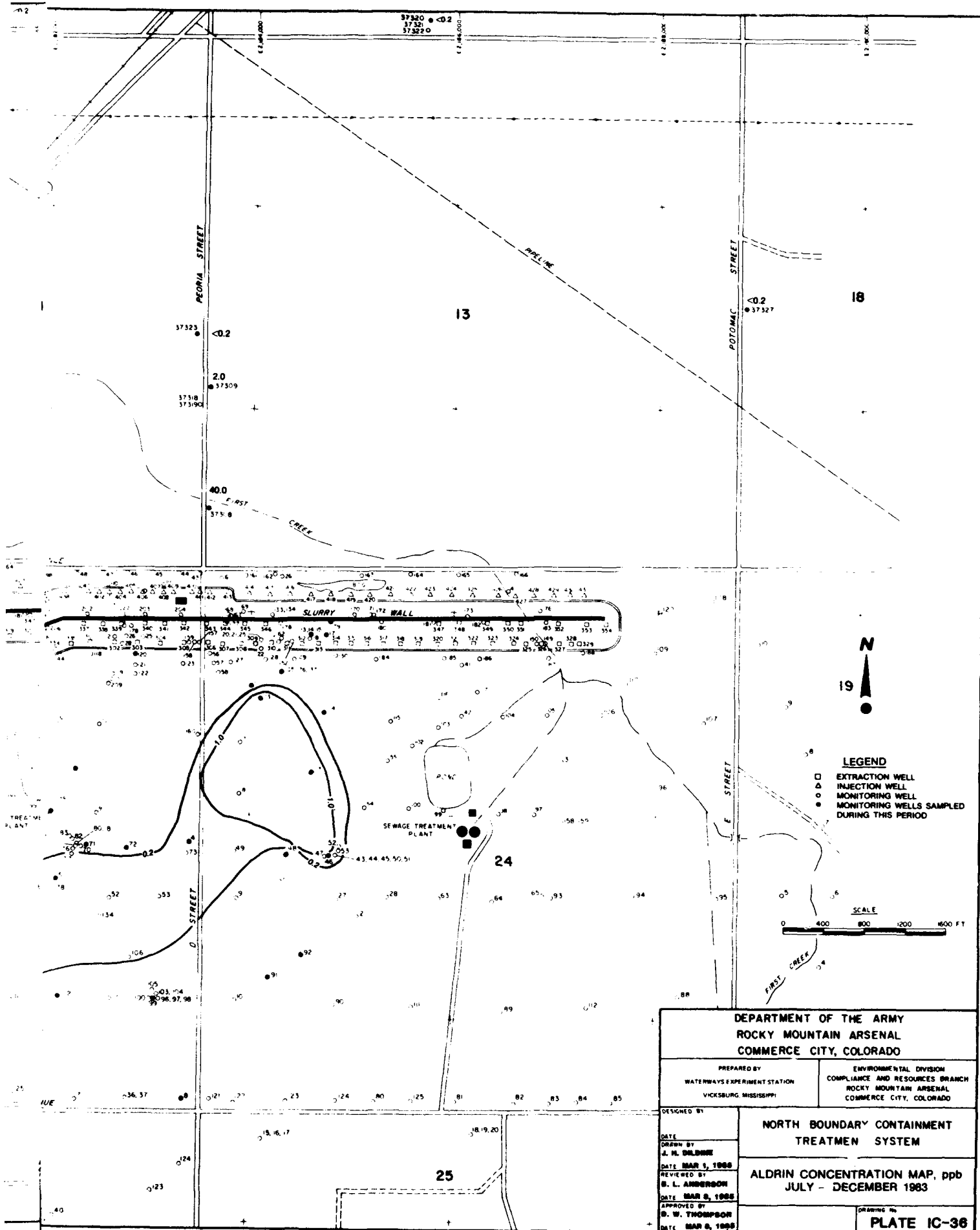


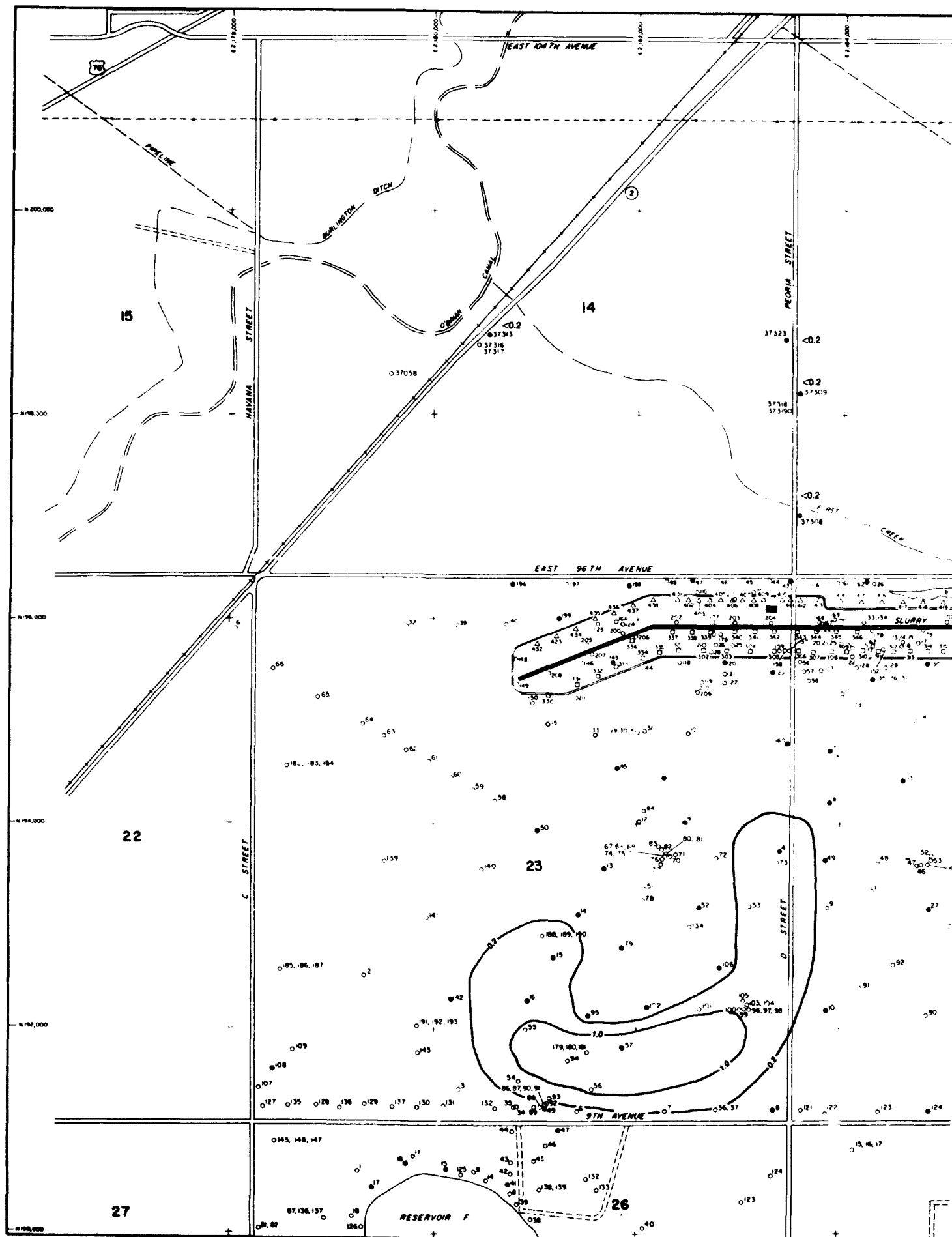




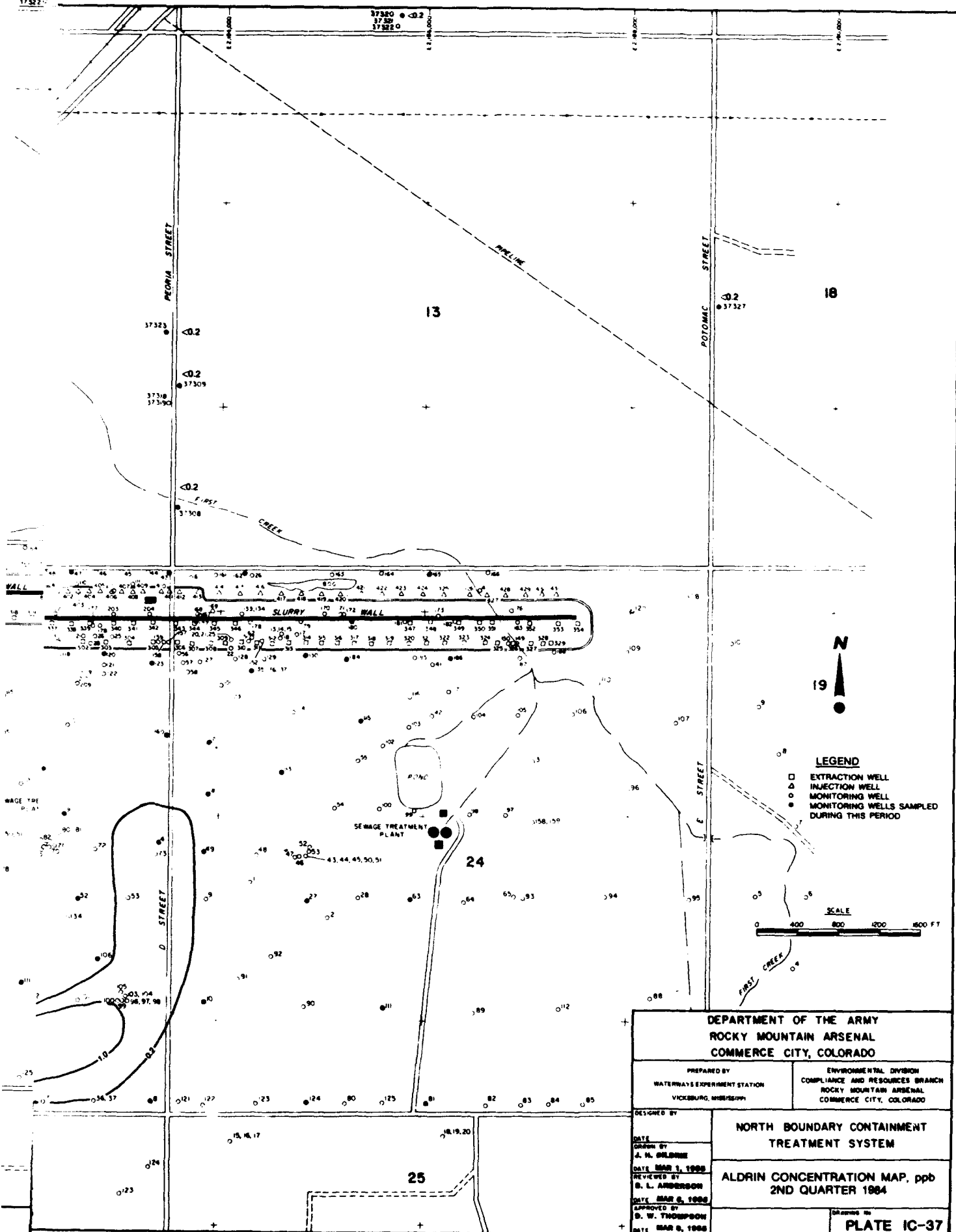




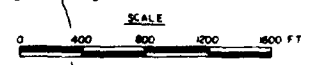




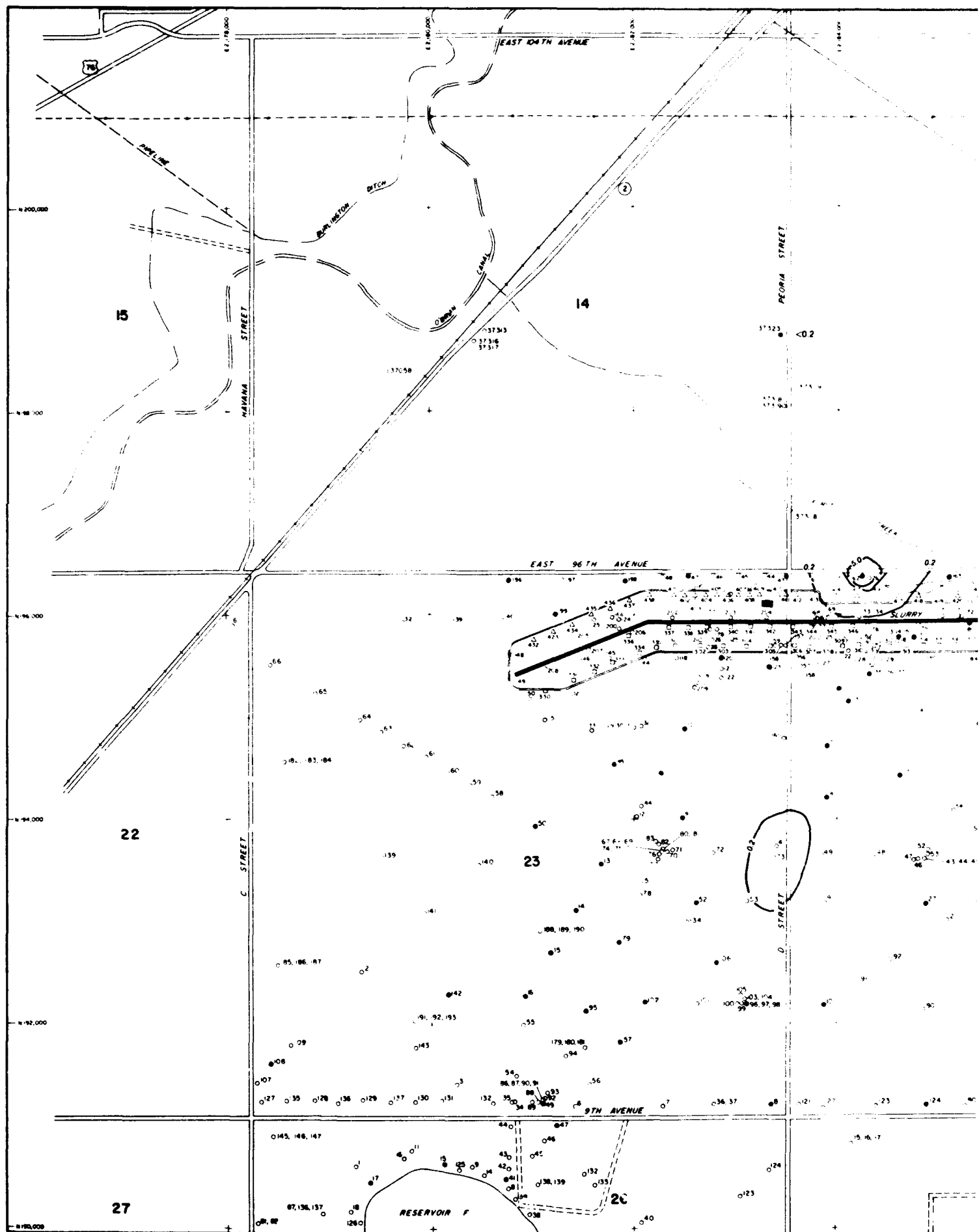
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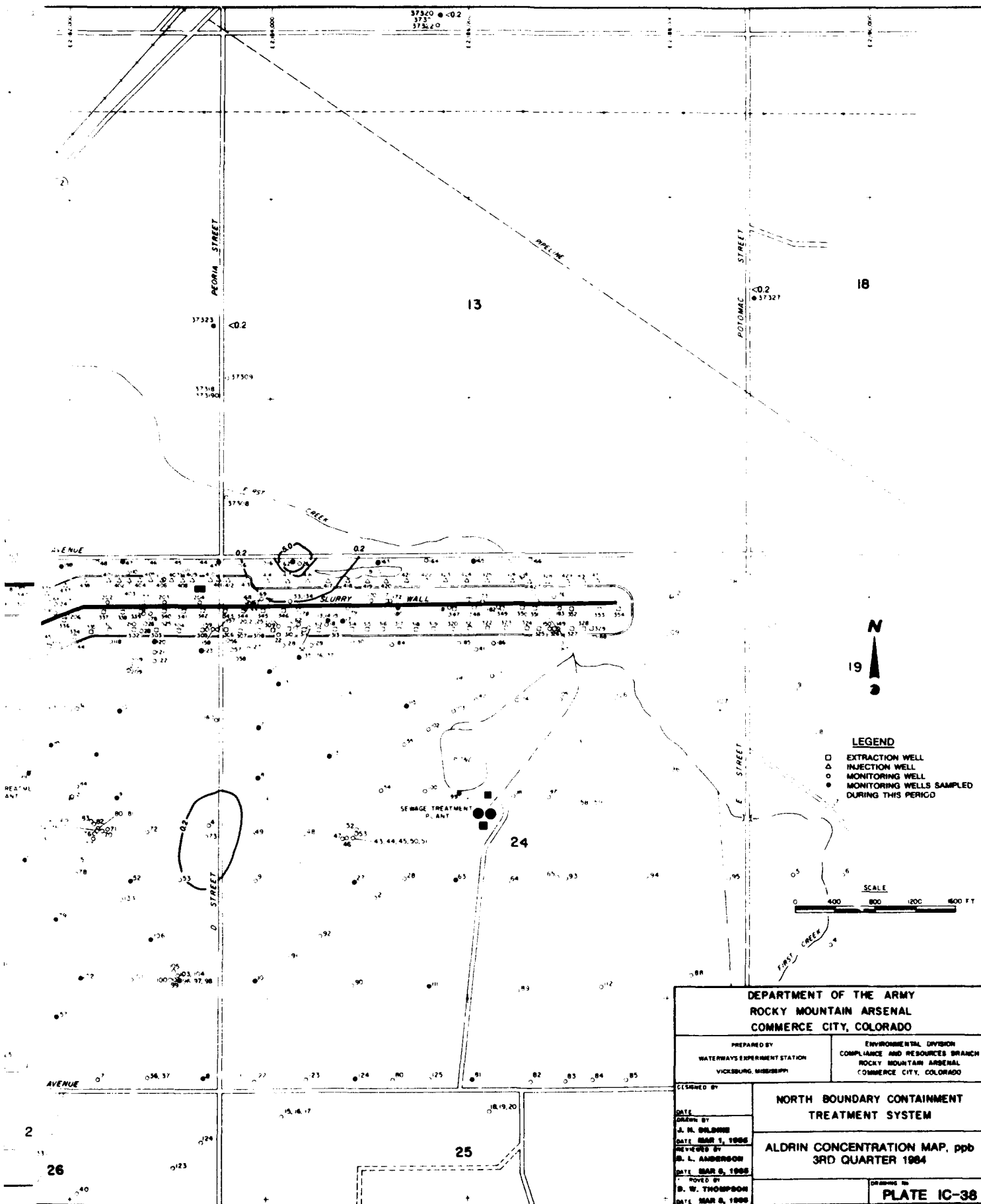


LEGEND
□ EXTRACTION WELL
△ INJECTION WELL
○ MONITORING WELL
● MONITORING WELLS SAMPLED DURING THIS PERIOD



DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION VICKSBURG, MISSISSIPPI	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM	
ALDRIN CONCENTRATION MAP, ppb 2ND QUARTER 1984	
DESIGNED BY DATE DRAWN BY J. M. GILMORE DATE MAY 1, 1984 REVIEWED BY B. L. ANDERSON DATE MAY 6, 1984 APPROVED BY D. W. THOMPSON DATE MAY 8, 1984	PLATE IC-37





LEGEND

- EXTRACTION WELL
- △ INJECTION WELL
- MONITORING WELL
- MONITORING WELLS SAMPLED DURING THIS PERIOD

SCALE

0 400 800 1200 1600 FT

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

PREPARED BY
WATERWAYS EXPERIMENT STATION
VICKSBURG, MISSISSIPPI

ENVIRONMENTAL DIVISION
COMPLIANCE AND RESOURCES BRANCH
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

DRAWN BY

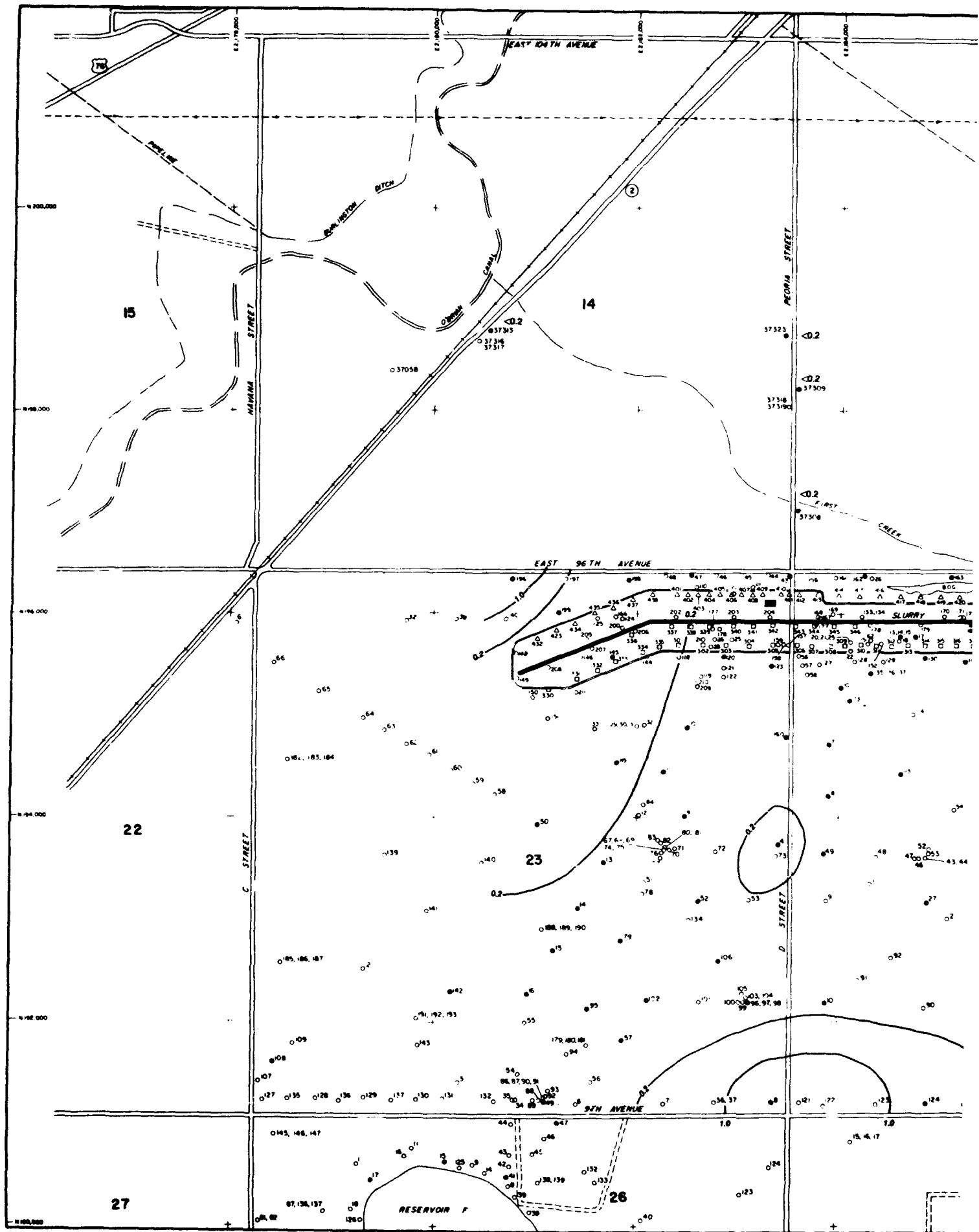
DATE
DRAWN BY
J. M. BROWN
DATE MAR 1, 1985
REVIEWED BY
S. L. ANDERSON
DATE MAR 6, 1985
APPROVED BY
S. W. THOMPSON
DATE MAR 6, 1985

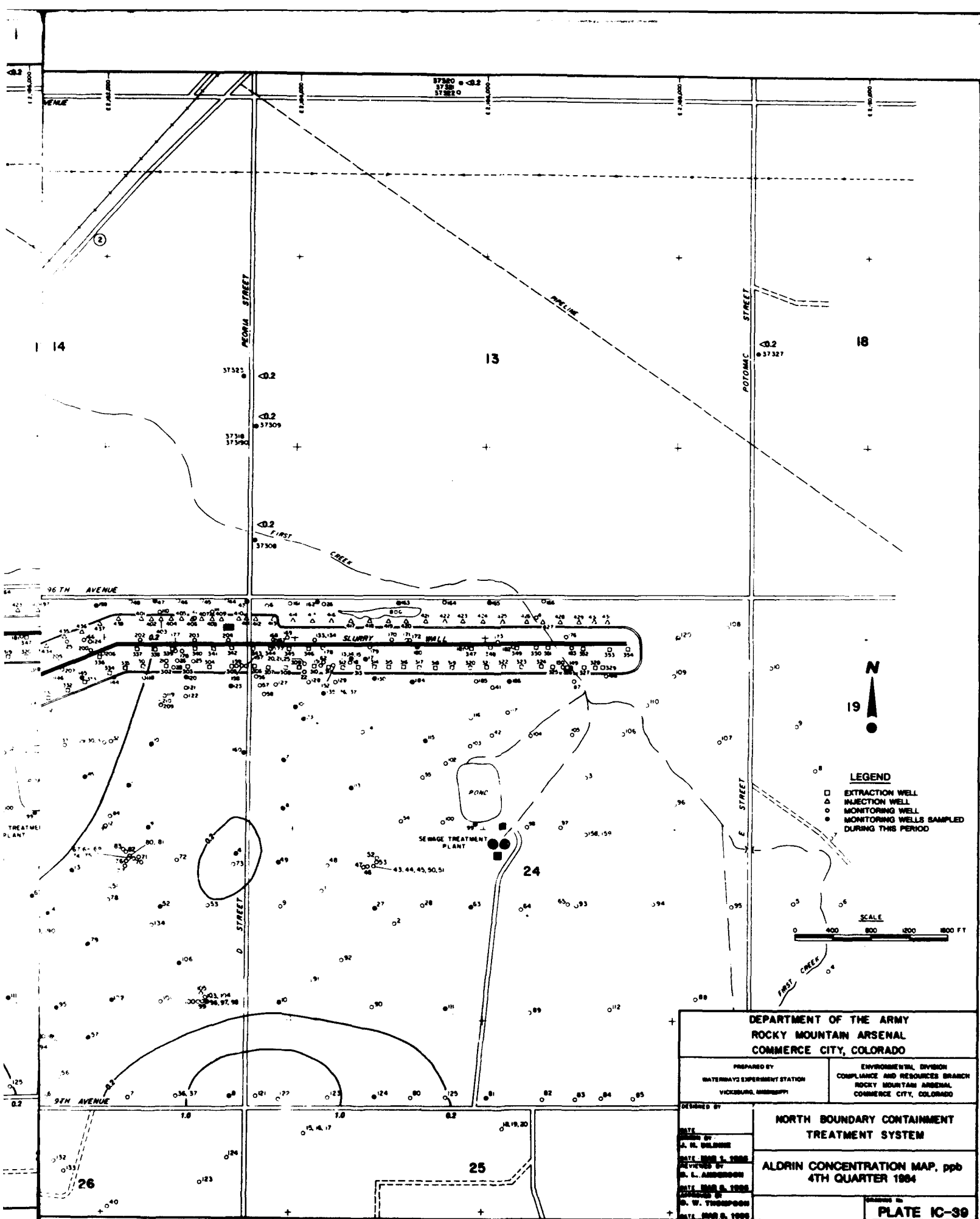
**NORTH BOUNDARY CONTAINMENT
TREATMENT SYSTEM**

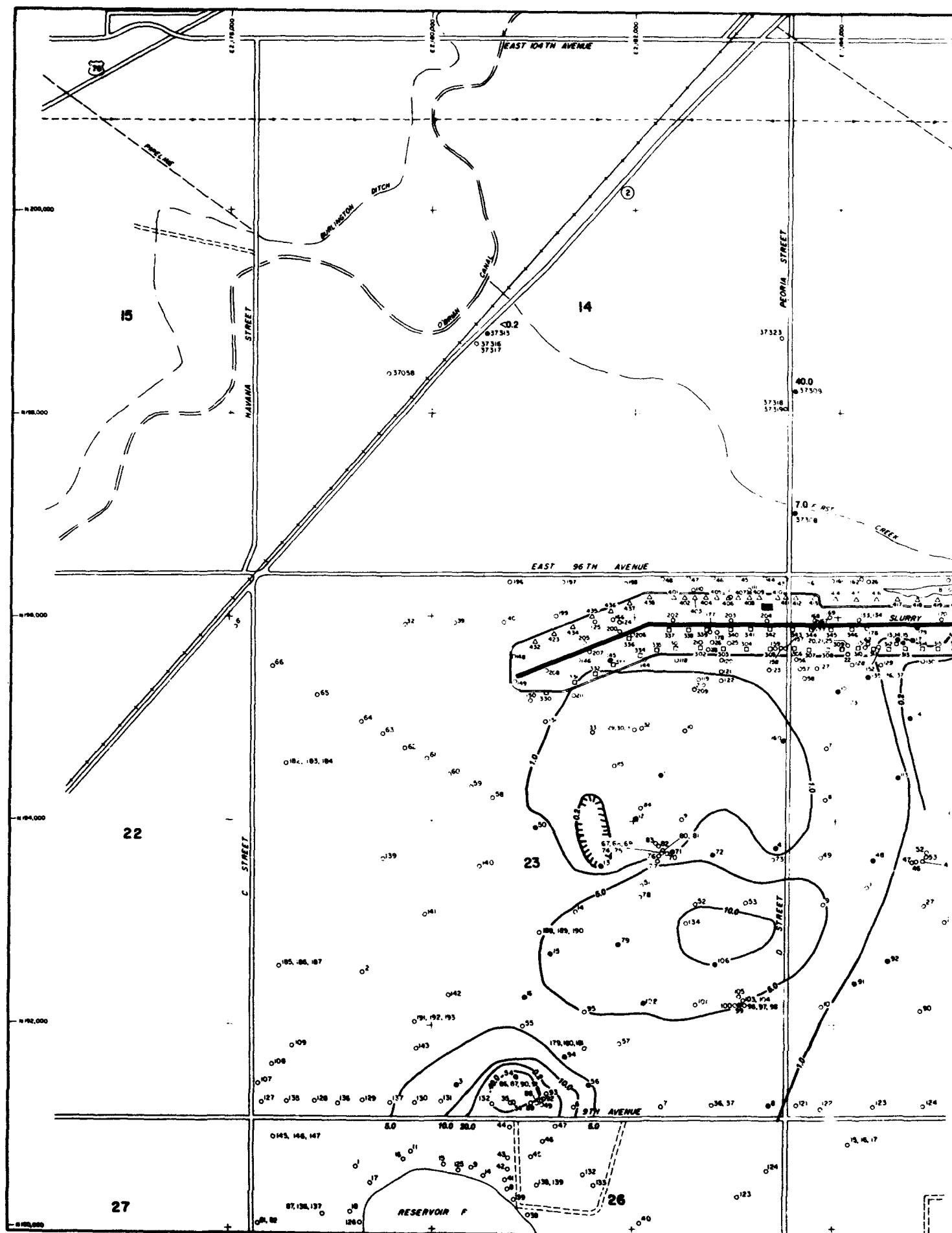
**ALDRIN CONCENTRATION MAP, ppb
3RD QUARTER 1984**

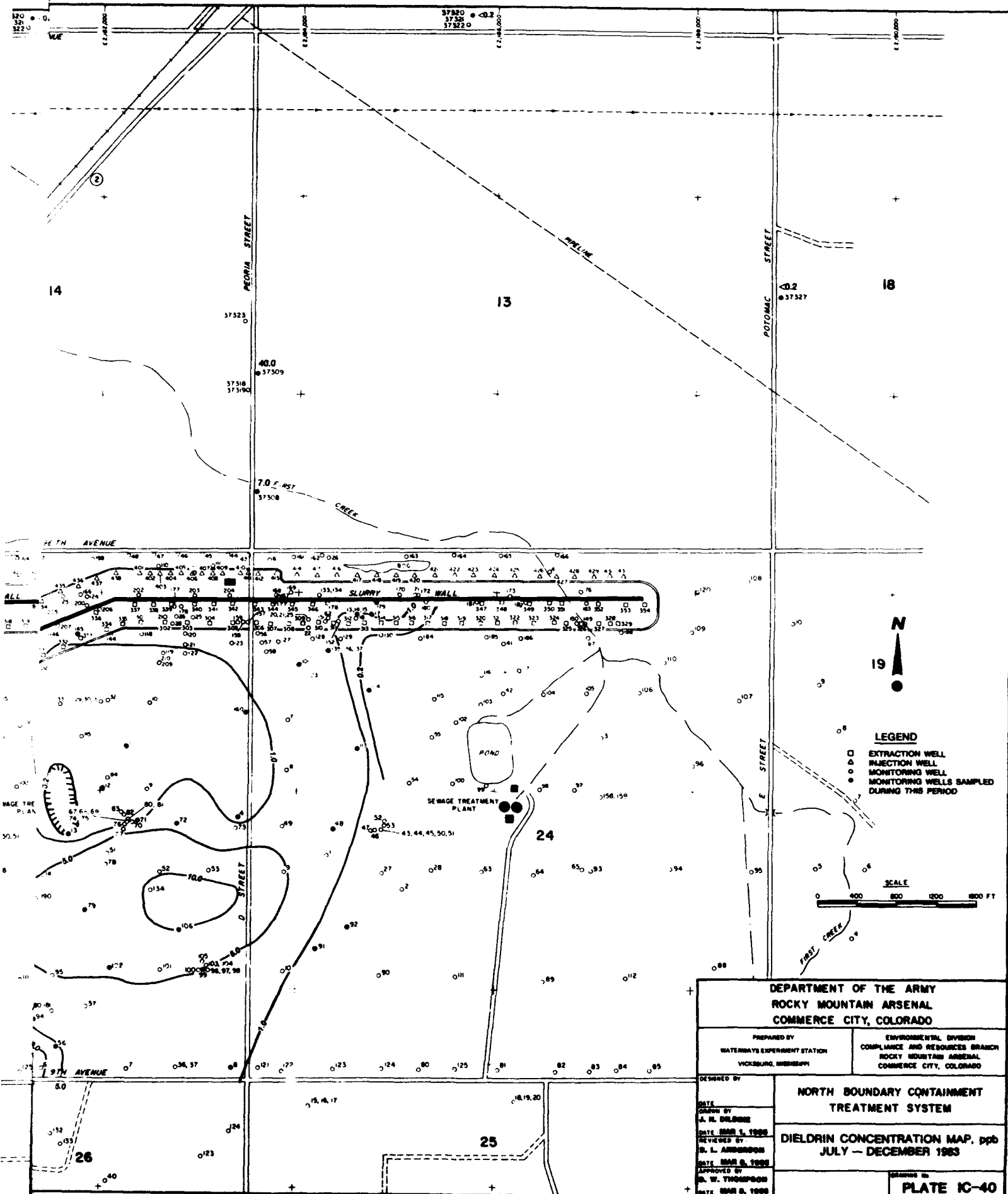
DRAWING NO.

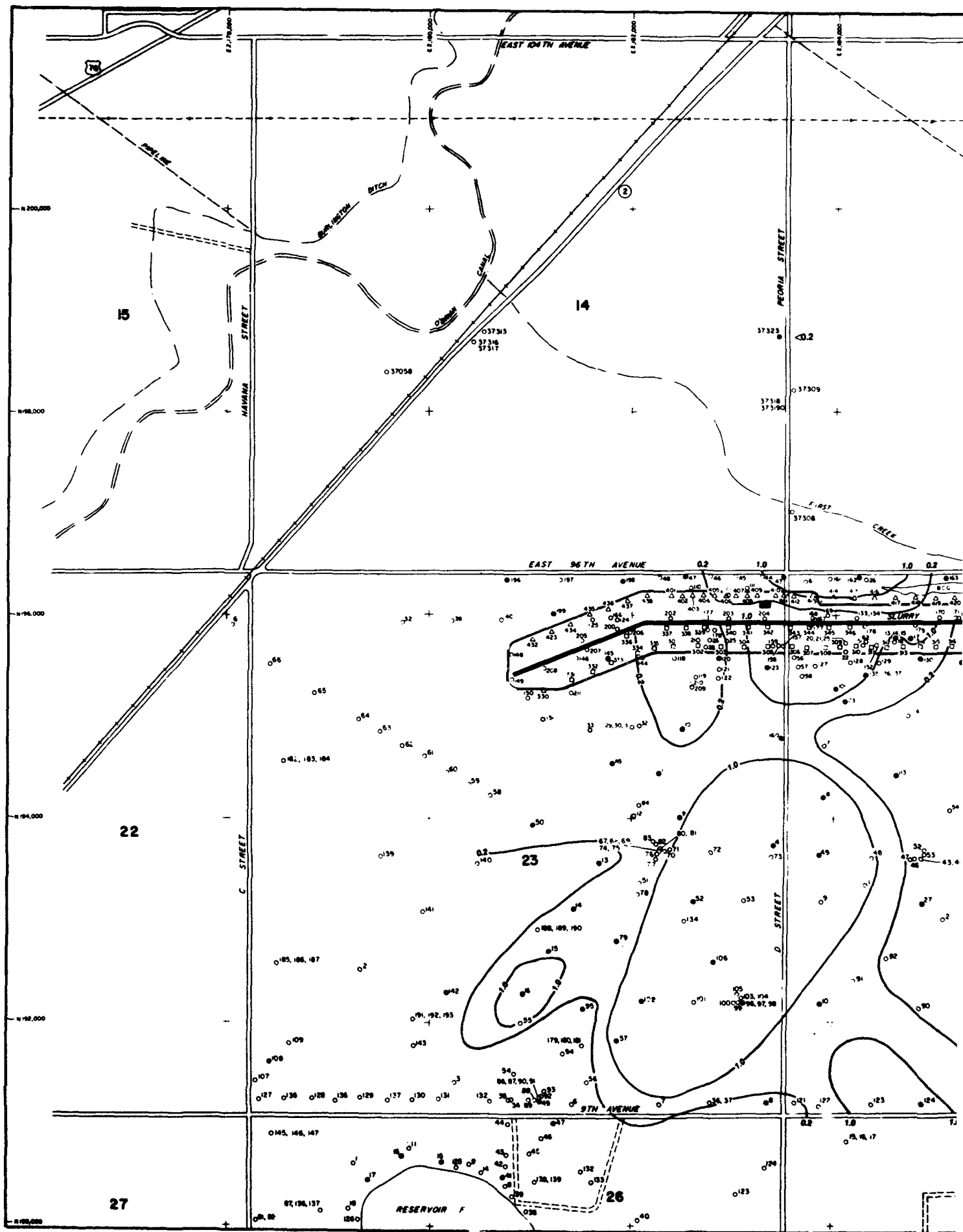
PLATE IC-38

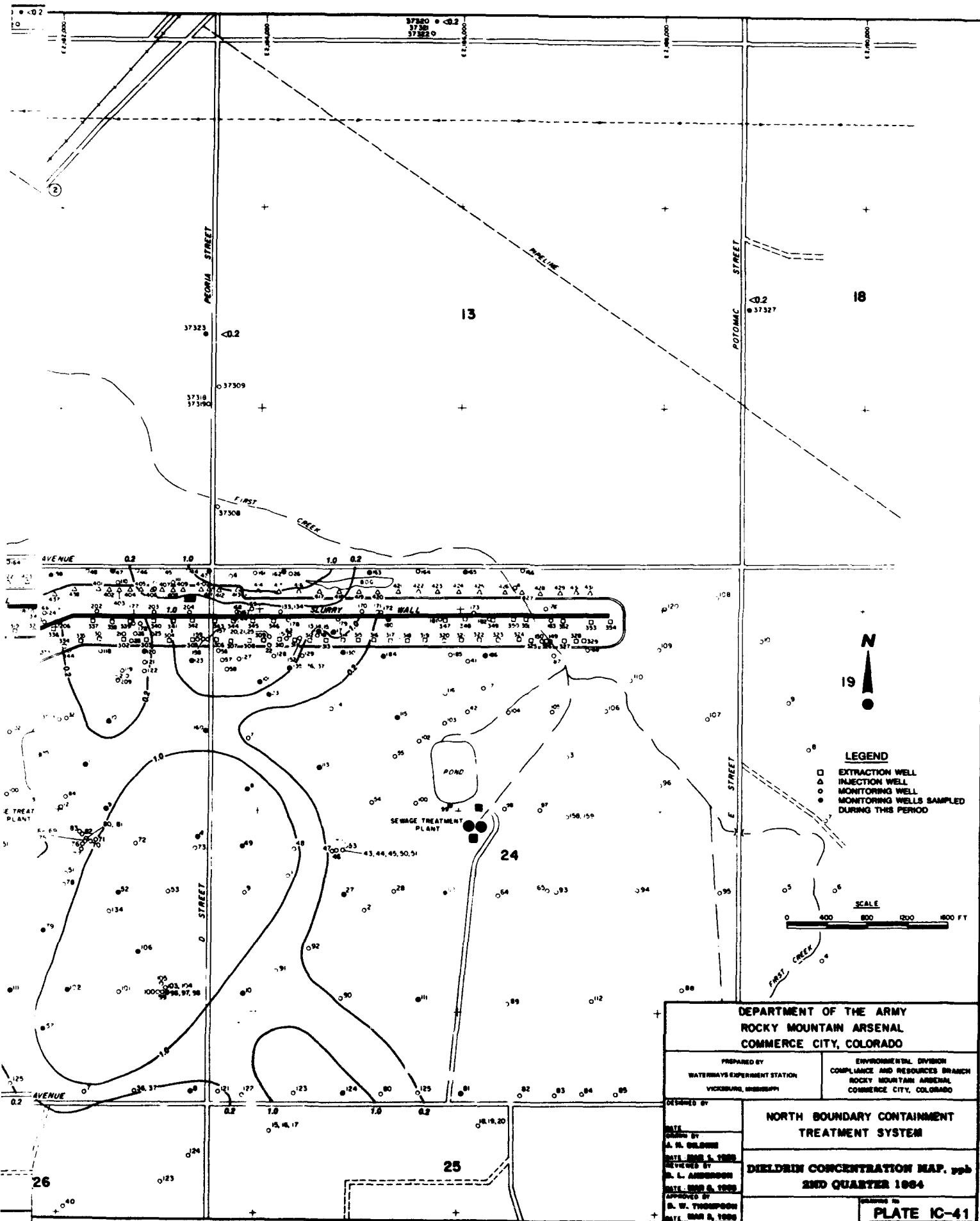


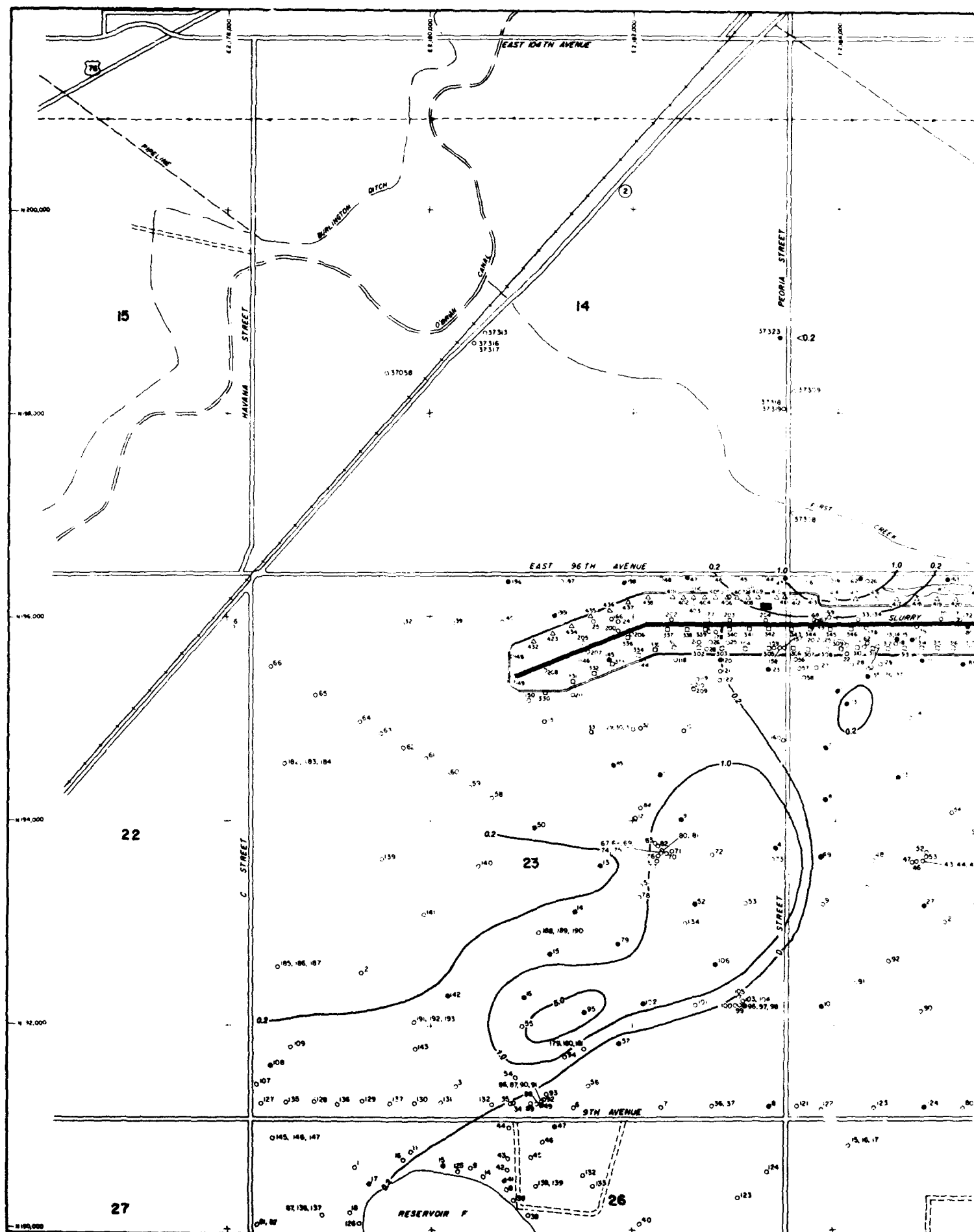


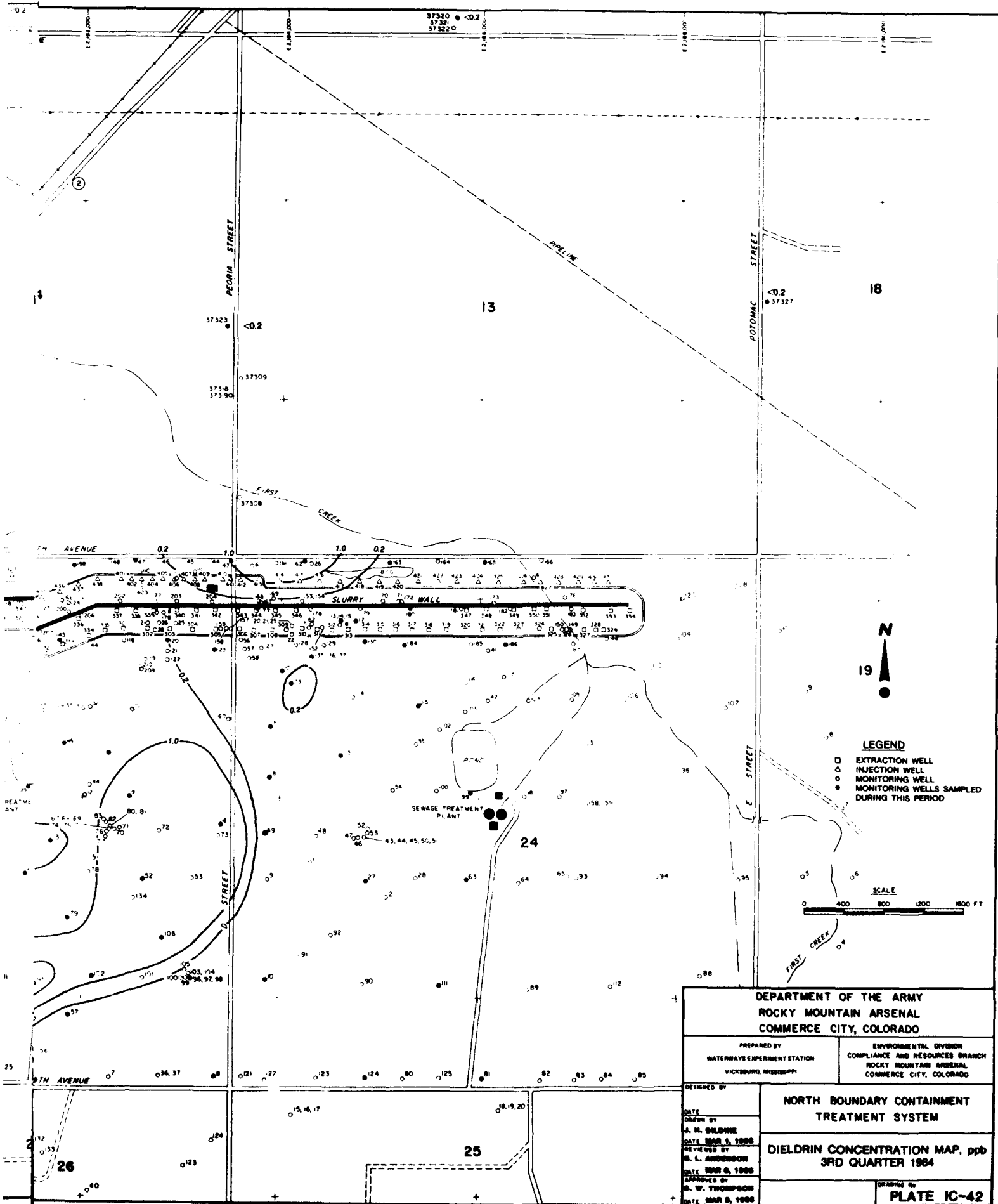


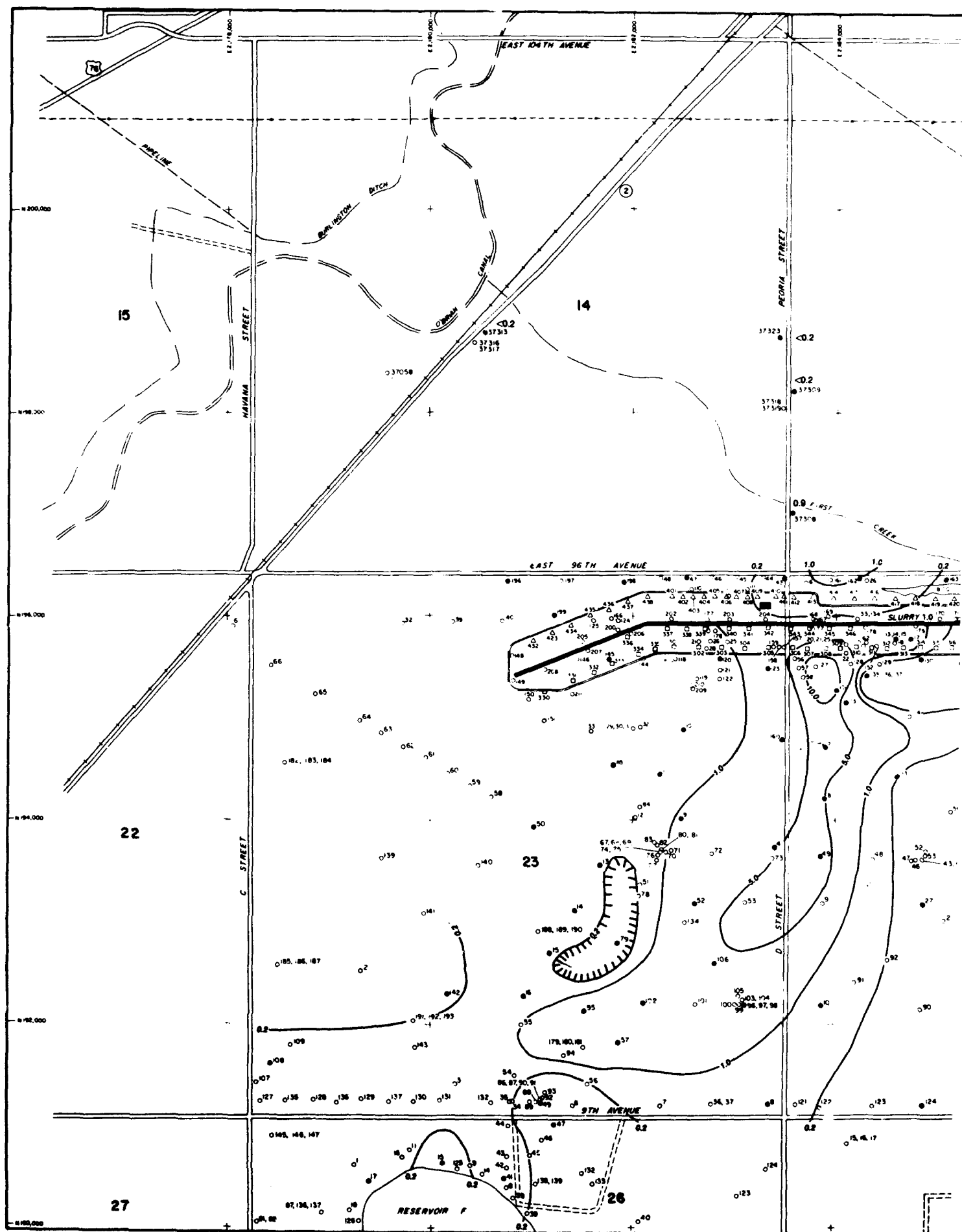


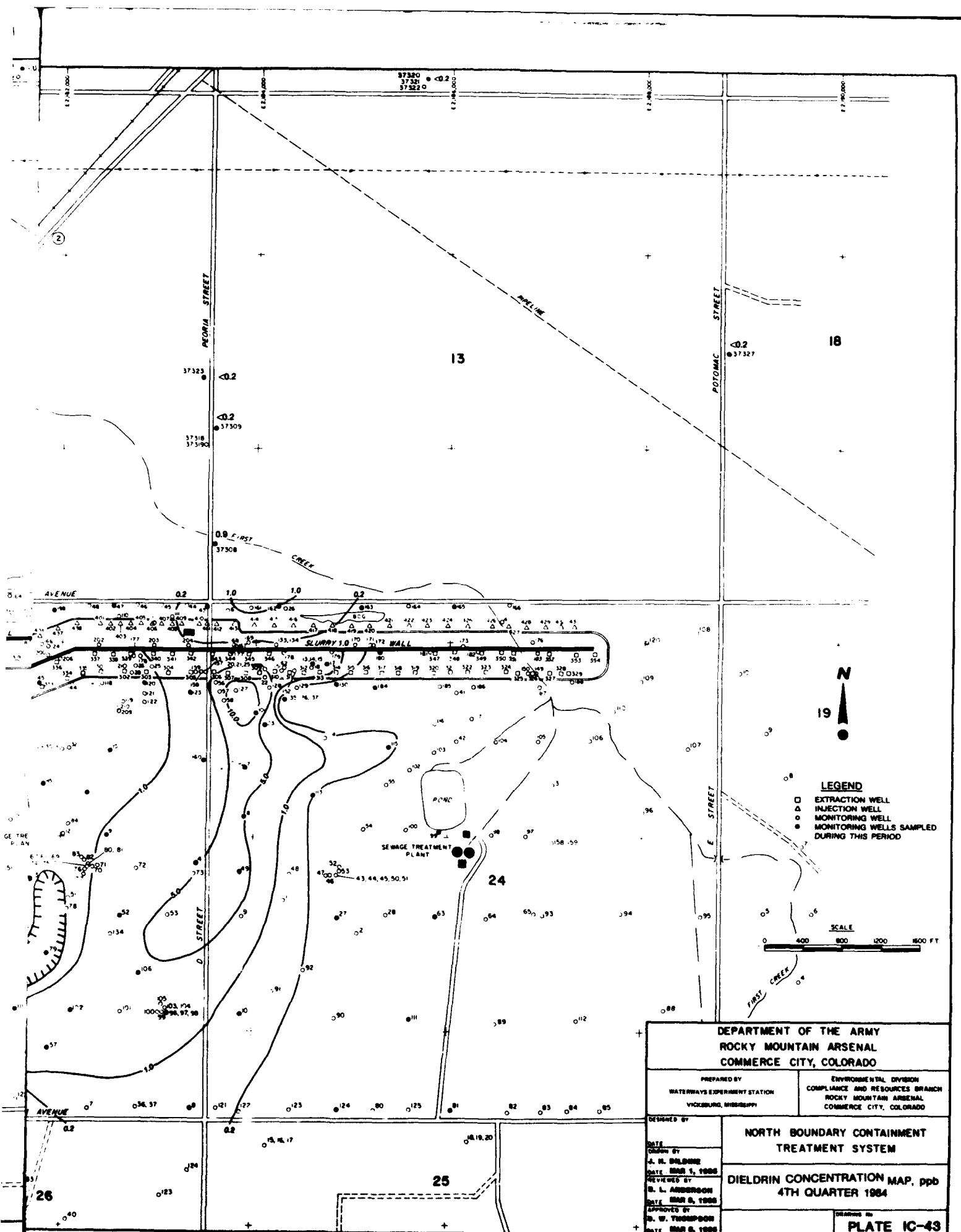


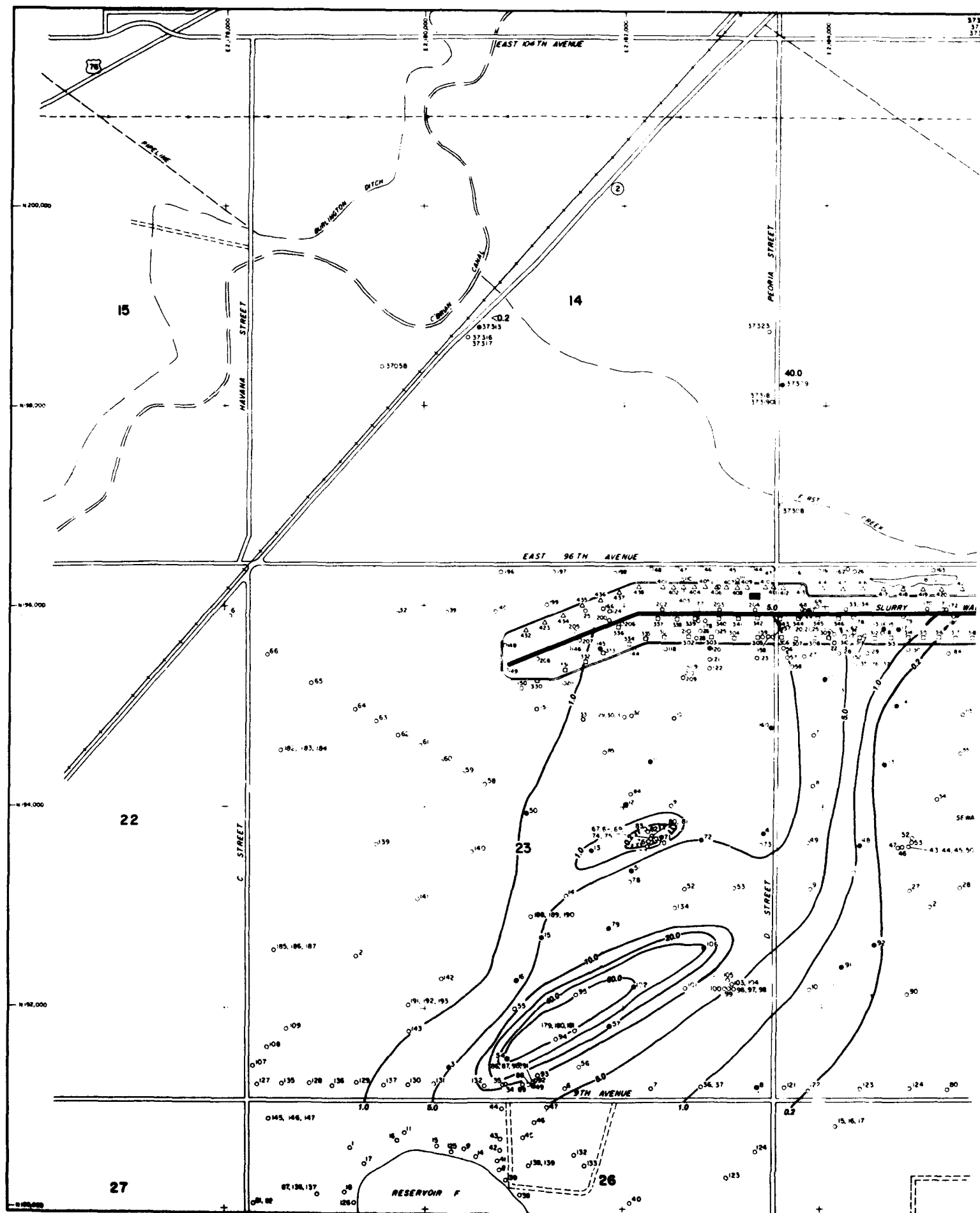


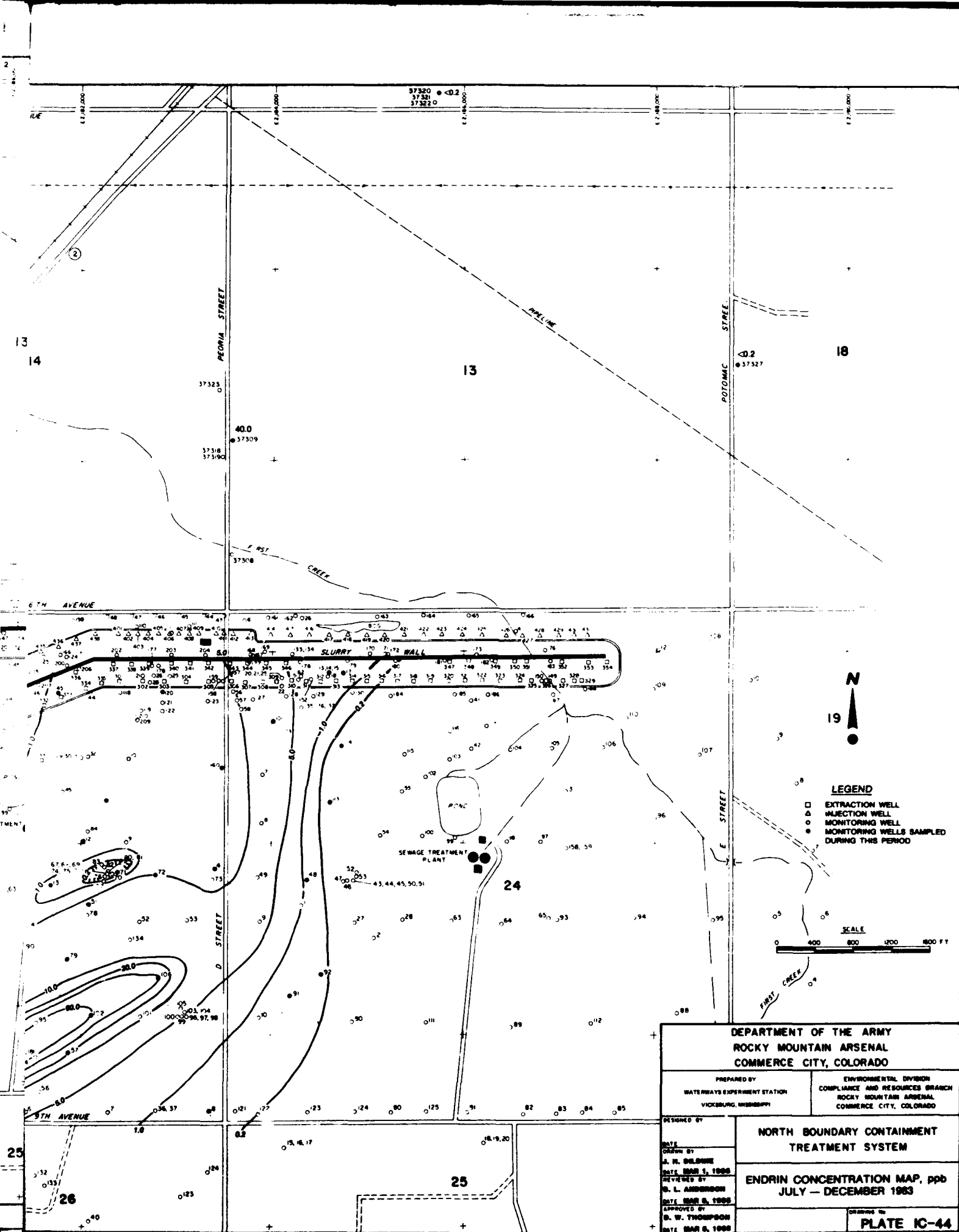


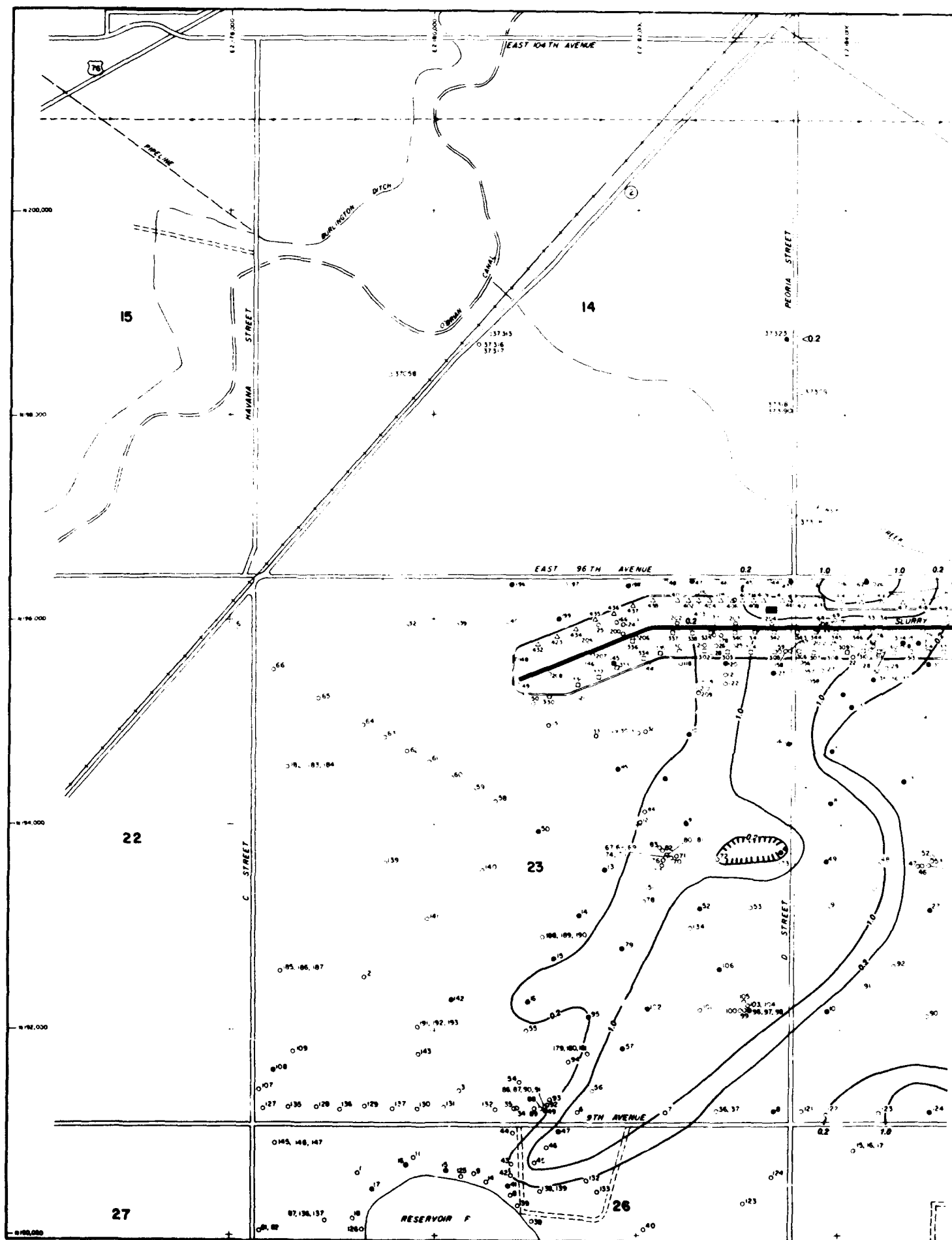


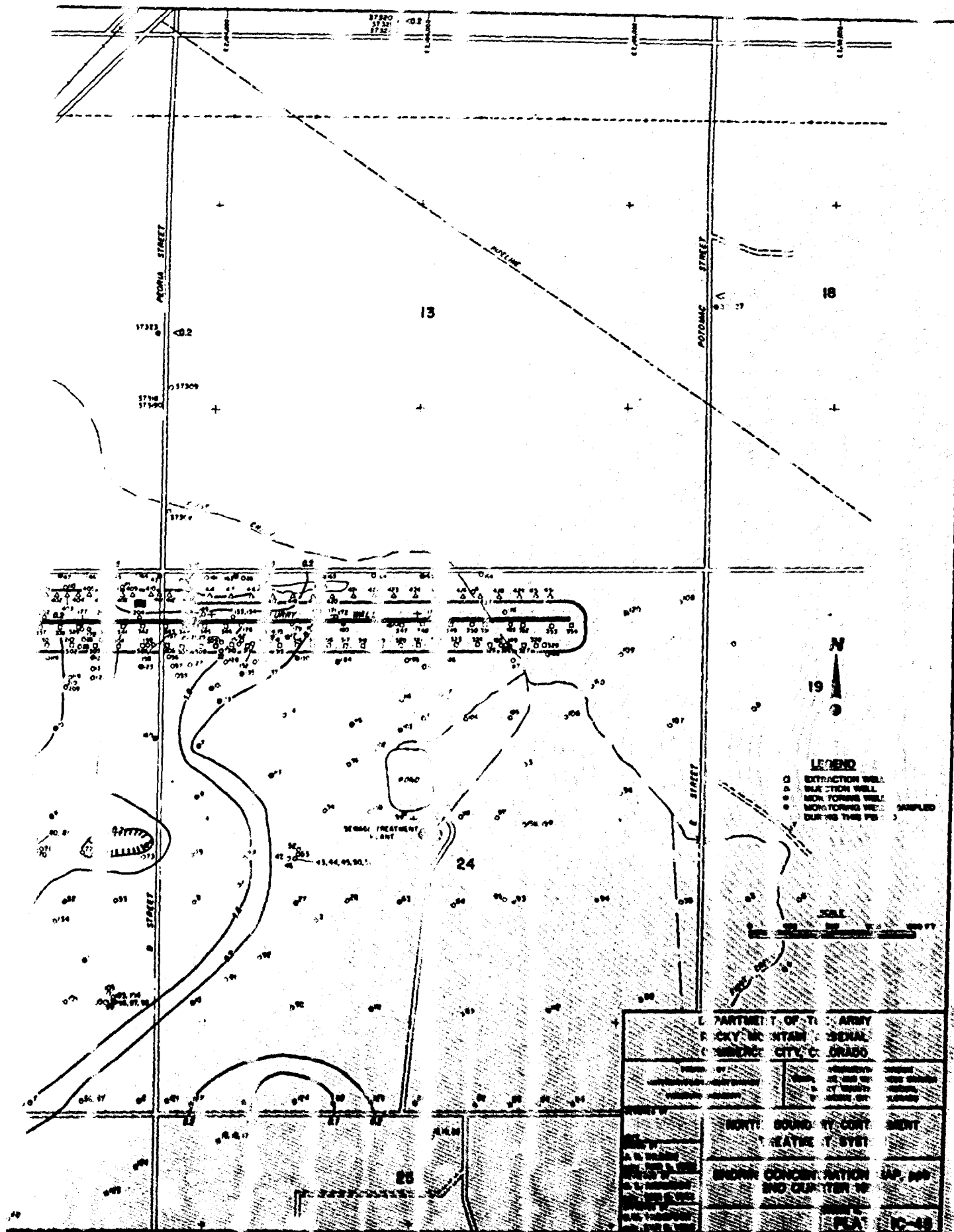


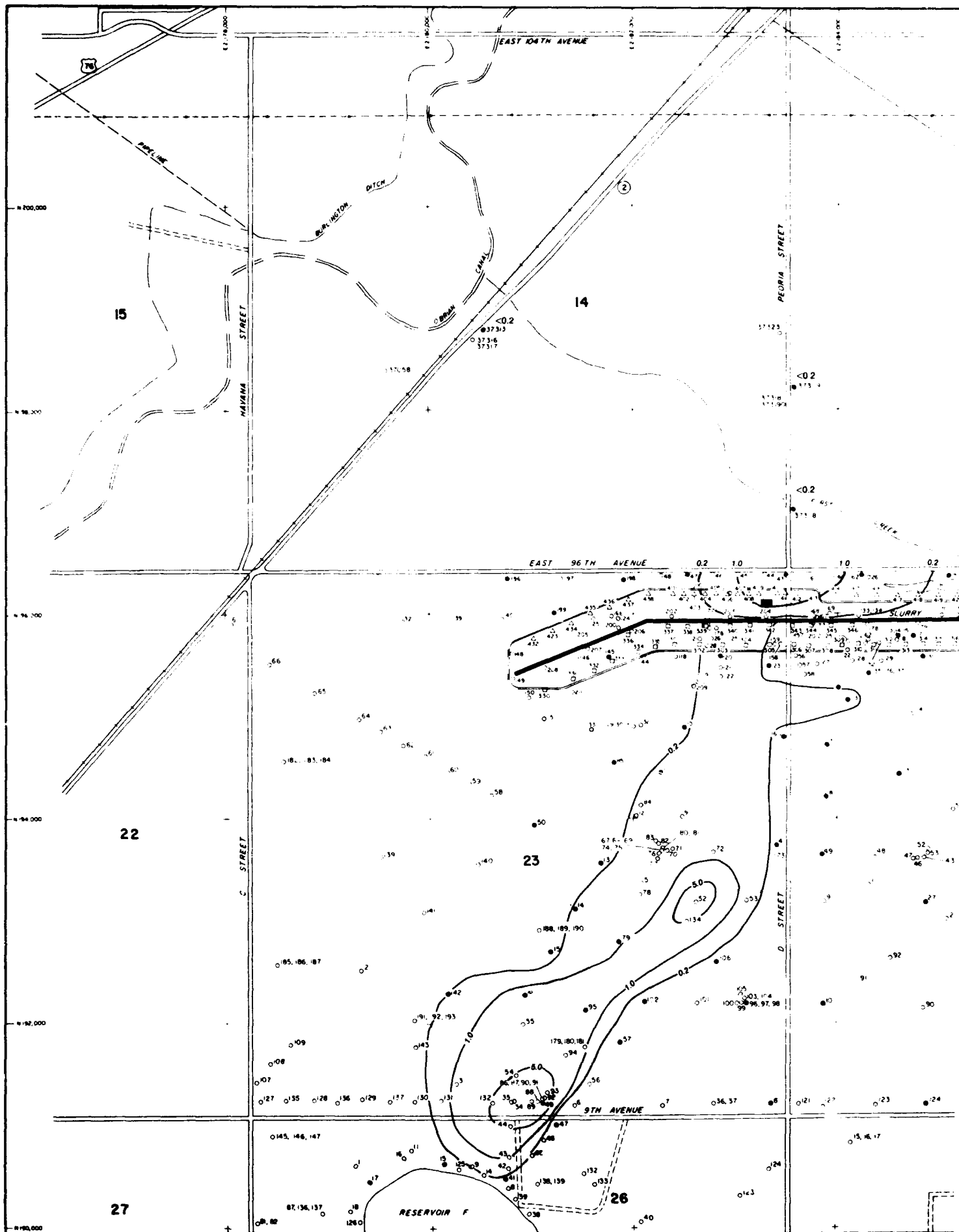


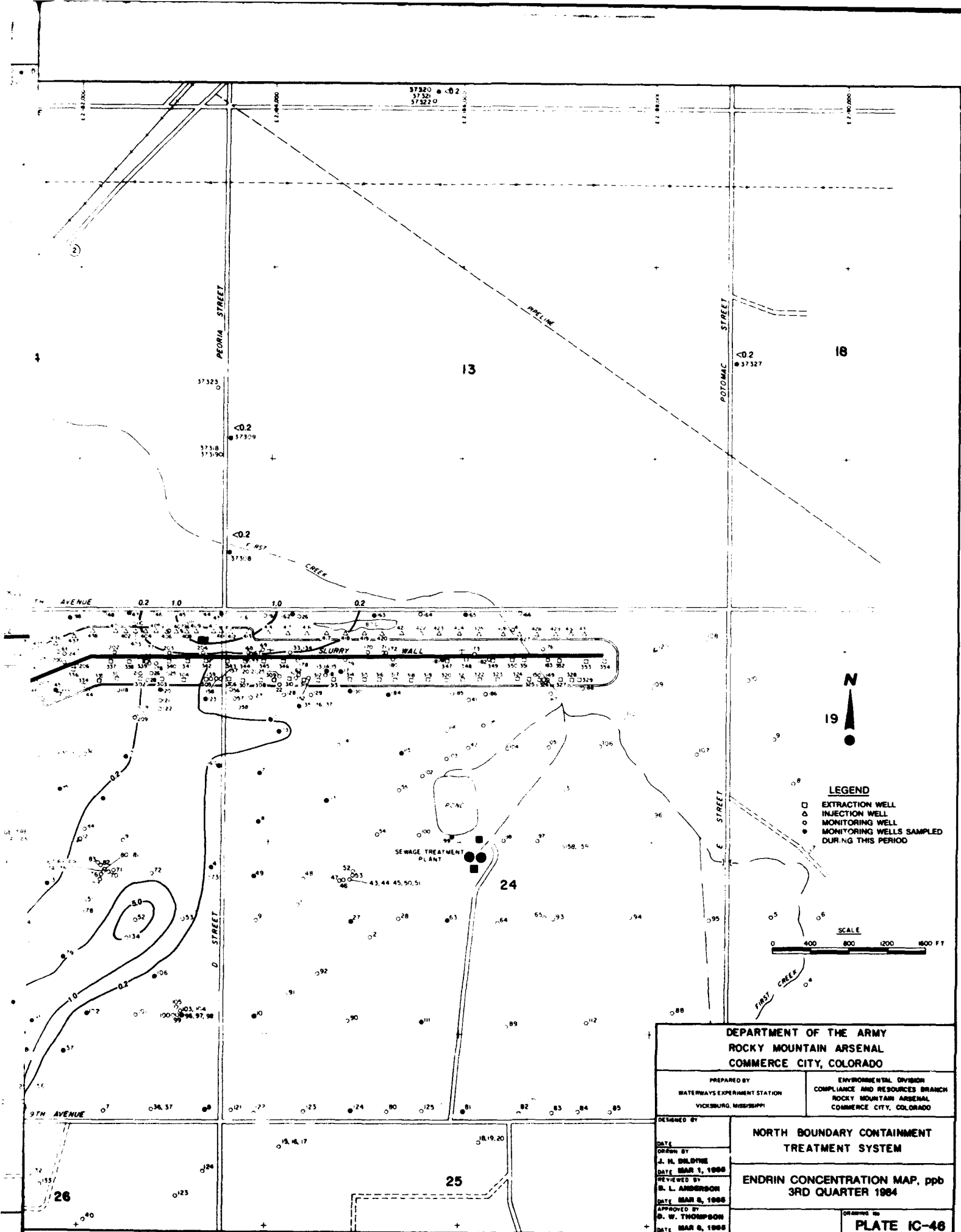












DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO	
PREPARED BY WATERWAYS EXPERIMENT STATION VICKSBURG, MISSISSIPPI	ENVIRONMENTAL DIVISION COMPLIANCE AND RESOURCES BRANCH ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO
DESIGNED BY DATE DRAWN BY J. H. DELANEY DATE MAR 1, 1985 REVIEWED BY B. L. ANDERSON DATE MAR 6, 1985 APPROVED BY B. W. THOMPSON DATE MAR 6, 1985	NORTH BOUNDARY CONTAINMENT TREATMENT SYSTEM ENDRIN CONCENTRATION MAP, ppb 3RD QUARTER 1984 DRAWING NO. PLATE IC-46

